WITHDRAWN
FROM HSNY LIBRARY

A CRITICAL REVISION OF THE GENUS EUCALYPTUS

BY

J. H. MAIDEN, I.S.O., F.R.S., F.L.S.

(Government Botanist of New South Wales and Director of the
Botanic Gardens, Sydney).

Vol. VI. Part 3.

PART LIII OF THE COMPLETE WORK.
(WITH FOUR PLATES.)

PRICE THREE SHILLINGS AND SIXPENCE.

Published by Authority of
THE GOVERNMENT OF THE STATE OF NEW SOUTH WALES.

Sydney:
WILLIAM APPLEGATE GULLICK, GOVERNMENT PRINTER.

1922.

INDEX OF PARTS PUBLISHED.

PART I.

1. *E. pilularis* Sm., and var. *Muelleriana* Maiden.
Plates, 1-4. (Issued March, 1903.)

PART II.

2. *E. obliqua* L' Héritier.
Plates, 5-8. (Issued May, 1903.)

PART III.

3. *E. calycogona* Turczaninow.
Plates, 9-12. (Issued July, 1903.)

PART IV.

4. *E. incrassata* Labillardière.
5. *E. fœcunda* Schauer.
Plates, 13-24. (Issued June, 1904.)

PART V.

6. *E. stellulata* Sieber.
7. *E. coriacea* A. Cunn.
8. *E. coccifera* Hook. f.
Plates, 25-28. (Issued November, 1904.)

PART VI.

9. *E. amygdalina* Labillardière.
10. *E. linearis* Dehnhardt.
11. *E. Risdoni* Hook. f.
Plates, 29-32. (Issued April, 1905.)

PART VII.

12. *E. regnans* F.v.M.
13. *E. vitellina Naudin*, and *E. vitrea* R. T. Baker.
14. *E. dives* Schauer.
15. *E. Andrewsi* Maiden.
16. *E. diversifolia* Bonpland.
Plates, 33-36. (Issued October, 1905.)

PART VIII.

17. *E. capitellata* Sm.
18. *E. Muelleriana* Howitt.
19. *E. macrorrhyncha* F.v.M.
20. *E. eugenioides* Sieber.
21. *E. marginata* Sm.
22. *E. buprestium* F.v.M.
23. *E. sepulcralis* F.v.M.
Plates, 37-40. (Issued March, 1907.)

PART IX.

24. *E. alpina* Lindl.
25. *E. microcorys* F.v.M.
26. *E. acmenioides* Schauer.
27. *E. umbra* R. T. Baker.
28. *E. virgata* Siebr.
29. *E. apiculata* Baker and Smith.
30. *E. Luehmanniana* F.v.M.
31. *E. Planchoniana* F.v.M.
Plates, 41-44. (Issued November, 1907

PART X.

32. *E. piperita* Sm.
33. *E. Sieberiana* F.v.M.
34. *E. Consideniana* Maiden.
35. *E. hæmastoma* Sm.
36. *E. siderophloia* Benth.
37. *E. Boormani* Deane and Maiden.
38. *E. leptophleba* F.v.M.
39. *E. Behriana* F.v.M.
40. *E. populifolia* Hook.
E. Bowmani F.v.M. (Doubtful species.)
Plates, 45-48. (Issued December, 1908.)

PART XI.

41. *E. Bosistoana* F.v.M.
42. *E. bicolor* A. Cunn.
43. *E. hemiphloia* F.v.M.
44. *E. odorata* Behr and Schlechtendal.
44 (*a*). *An Ironbark Box.*
45. *E. fruticetorum* F.v.M.
46. *E. acacioides* A. Cunn.
47. *E. Thozetiana* F.v.M.
48. *E. ochrophloia* F.v.M.
49. *E. microtheca* F.v.M.
Plates, 49-52. (Issued February, 1910.)

PART XII.

50. *E. Raveretiana* F.v.M.
51. *E. crebra* F.v.M.
52. *E. Staigeriana* F.v.M.
53. *E. melanophloia* F.v.M.
54. *E. pruinosa* Schauer.
55. *E. Smithii* R. T. Baker.
56. *E. Naudiniana* F.v.M.
57. *E. sideroxylon* A. Cunn.
58. *E. leucoxylon* F.v.M.
59. *E. Caleyi* Maiden.
Plates, 53-56. (Issued November, 1910.)

PART XIII.

60. *E. affinis* Deane and Maiden.
61. *E. paniculata* Sm.
62. *E. polyanthemos* Schauer.
63. *E. Rudderi* Maiden.
64. *E. Baueriana* Schauer.
65. *E. cneorifolia* DC.
Plates, 57-60. (Issued July, 1911.)

PART XIV.

66. *E. melliodora* A. Cunn.
67. *E. fasciculosa* F.v.M.
68. *E. uncinata* Turczaninow.
69. *E. decipiens* Endl.
70. *E. concolor* Schauer.
71. *E. Clöeziana* F.v.M.
72. *E. oligantha* Schauer.
Plates, 61-64. (Issued March, 1912.)

PART XV.

73. *E. oleosa* F.v.M.
74. *E. Gillii* Maiden.
75. *E. falcata* Turcz.
Plates, 65-68. (Issued July, 1912.)

PART XVI.

E. oleosa F.v.M., var. *Flocktoniæ* Maiden.
76. *E. Le Souefii* Maiden.
77. *E. Clelandi* Maiden.
78. *E. decurva* F.v.M.
79. *E. doratoxylon* F.v.M.
80. *E. corrugata* Luehmann.
81. *E. goniantha* Turcz.
82. *E. Stricklandi* Maiden.
83. *E. Campaspe* S. le M. Moore.
84. *E. diptera* Andrews.
85. *E. Griffithsii* Maiden.
86. *E. grossa* F.v.M.
87. *E. Pimpiniana* Maiden.
88. *E. Woodwardi* Maiden.
Plates, 69-72. (Issued September, 1912.)

PART XVII.

89. *E. salmonophloia* F.v.M.
90. *E. leptopoda* Bentham.
91. *E. squamosa* Deane and Maiden.
92. *E. Oldfieldii* F.v.M.
93. *E. orbifolia* F.v.M.
94. *E. pyriformis* Turczaninow.
Plates, 73-76. (Issued February, 1913.)

PART XVIII.

95. *E. macrocarpa* Hook.
96. *E. Preissiana* Schauer.
97. *E. megacarpa* F.v.M.
98. *E. globulus* Labillardière.
99. *E. Maideni* F.v.M.
100. *E. urnigera* Hook. f.
Plates, 77-80. (Issued July, 1913.)

PART XIX.

101. *E. goniocalyx* F.v.M.
102. *E. nitens* Maiden.
103. *E. elæophora* F.v.M.
104. *E. cordata* Labill.
105. *E. angustissima* F.v.M.
Plates, 81-84. (Issued December, 1913.)

PART XX.

106. *E. gigantea* Hook. f.
107. *E. longifolia* Link and Otto.
108. *E. diversicolor* F.v.M.
109. *E. Guilfoylei* Maiden.
110. *E. patens* Bentham.
111. *E. Todtiana* F.v.M.
112. *E. micranthera* F.v.M.
Plates 85-88. (Issued March, 1914.)

THE LuESTHER T. MERTZ LIBRARY

THE LuESTHER T. MERTZ LIBRARY
THE NEW YORK BOTANICAL GARDEN

A CRITICAL REVISION OF THE GENUS EUCALYPTUS

BY

J. H. MAIDEN, I.S.O., F.R.S., F.L.S.

(Government Botanist of New South Wales and Director of the Botanic Gardens, Sydney).

VOL. VI. PART 3.

Part LIII of the Complete Work.

(WITH FOUR PLATES.)

> *"Ages are spent in collecting materials, ages more in separating and combining them. Even when a system has been formed, there is still something to add, to alter, or to reject. Every generation enjoys the use of a vast hoard bequeathed to it by antiquity, and transmits that hoard, augmented by fresh acquisitions, to future ages. In these pursuits, therefore, the first speculators lie under great disadvantages, and even when they fail, are entitled to praise."*
>
> MACAULAY'S "ESSAY ON MILTON."

PRICE THREE SHILLINGS AND SIXPENCE.

Published by Authority of
THE GOVERNMENT OF THE STATE OF NEW SOUTH WALES.

Sydney:
WILLIAM APPLEGATE GULLICK, GOVERNMENT PRINTER, PHILLIP-STREET.

*39093 -A

1922.

QL
247
.E9
M33
v.6
pt.3
c.2

NATURAL HYBRIDS.

AUSTRALIAN.

PAGE.
CCCI. x *E. Barmedmanensis* n.sp. 108
CCCII. x *E. Tenandrensis* n.sp. 112
CCCIII. x *E. Peacockeana* n.sp. 113
CCCIV. x *E. Stopfordi* n.sp. 114
CCCV. x *E. Forsythii* n.sp. 115
CCCVI. x *E. Auburnensis* n.sp. 116
CCCVI. x *E. Yagobiei* n.sp. . . . . , . . 118
CCCVIII. x *E. Blackburniana* n.sp. 120
CCCIX. x *E. Studleyensis* n.sp. 121
Miscellaneous Notes on Hybrids . 123

No. III. The Timber.

(Continued from Part LII, page 105).

Historical. Early attempts at classification . . . 128

Modern general systems of classification (1892-1921)—

Maiden (various dates from 1892 to 1921) . . . 130
Baker (1917, 1919) 135

Classification by Colours—

"The accumulation of waste in wood" . . . 137

Modern systems of classification mainly by colours (1892-1921)—

Maiden (various dates from 1892 to 1921) . 137, 138, 139
Baker (1913, 1917, 1918) 138, 139

No. 111. The Timber—*continued.*

PAGE.

Maiden's 1921 classification worked out in detail—

1. Pale Hardwoods 142
2. Brown Hardwoods 150
3. Red Hardwoods 152
4. Ironbarks 155
5. Bloodwoods 157
6. Western Australian Hardwoods 160

Explanation of Plates (216-219) 164

NATURAL HYBRIDS.

We now come to the main selection of such spontaneous hybrids as have come under my notice in Australia. Now that attention has been prominently drawn to the subject, with concrete instances, I confidently predict that records will be made of very many more.

The instances given include evidence in proof of the fact, to which I have long since drawn attention, of the proneness of some of the Ironbarks and Boxes to hybridise.

Following is a list in those described in the present Part, and cognisance will be taken of a few more in Part 54 :—

x *E. Barmedmanensis* Maiden, n.sp.
x *E. Tenandrensis* Maiden, n.sp.
x *E. Peacockeana* Maiden, n.sp.
x *E. Stopfordi* Maiden, n.sp.
x *E. Forsythii* Maiden, n.sp.
x *E. Auburnensis* Maiden, n.sp.
x *E. Yagobiei* Maiden, n.sp.
x *E. Blackburniana* Maiden.
x *E. Studleyensis* Maiden, n.sp.

[Perhaps this will be an appropriate place for the following statement :—

" The consideration of all these facts led me years ago to raise the question whether hybrids could originate species (*Oesterreich. bot. Zeitschr.* xxi, 34, 1871), and to answer it in the affirmative. Looked at from this point of view, the hybrids which have been and are being produced in nature acquire a special significance, and it becomes important to form a correct notion as to their existence, behaviour and distribution in localities where the life of plants is untrammelled and undisturbed. Only the vegetation of Europe has been thoroughly studied in this connection; yet this alone affords a fund of information, and we may take it for granted that what is true for Europe will apply likewise to the other quarters of the globe." (Kerner in Kerner and Oliver, " The Natural History of Plants," ii, 582.)]

DESCRIPTION.

CCCI. × *E. Barmedmanensis* Maiden, n.sp.

Reputed parents, *E. sideroxylon* A. Cunn., and *E. melliodora* A. Cunn.

Before submitting a formal description of this hybrid and of some trees which are close to, and probably identical with it, it will be instructive to quote three passages from Mr. R. H. Cambage's writings and one from my own.

A.—Cobar to the Bogan River, above Nyngan, N.S.W.—

> In view of the prominence of the question of hybridisation of Eucalypts . . . (here comes a passage printed in Part LII, p. 65). These are points of circumstantial evidence which suggest hybridisation. There is one feature in which this tree more nearly resembles the Ironbark than the Box, and it is in regard to the colour of the sap (wood), which is a yellowish-green, similar to Ironbark, while that of the Box is white. In general appearance the tree is much like *E. affinis*, but the fruits separate them. It is also like the doubtful tree at Liverpool. The chief flowering time of *E. sideroxylon* in the west is about April and May, but flowers can generally be found before and after those months. I have seen it flowering at Cabramatta in January and July. *E. Woollsiana* flowers about February and March, but flowers of this species have been collected in May in the same locality as that in which *E. sideroxylon* was then flowering. I am not able to state the flowering time of the tree which looks half Box and half Ironbark, for though a very few flowers were collected in June, buds were found in September, which seemed to indicate that the trees would be flowering in October. The scarcity of the tree makes it difficult to arrive at a definite conclusion in the matter. It is no part of my purpose to try and prove that the tree in question is a hybrid, but simply to offer observations which may assist in settling the question. I have handed specimens to Mr. Deane, who will probably investigate this species.

(R. H. Cambage in *Proc. Linn. Soc. N.S.W.*, xxv, 716, 1900.) (I was then in Europe at the time, and Mr. Deane handed me the specimens on my return. J.H.M.)

B.—Mr. Cambage is travelling from Mount Hope to Parkes, and is on the Melrose road, approaching Condobolin :—

> Finding *E. sideroxylon* and *E. Woollsiana* growing together between the three and four-mile posts, I searched for the supposed hybrid or Ironbark-Box, and succeeded in finding a few trees on the eastern side of the road. None were growing within sight from the road, and had their presence not been suspected, they would have been passed unnoticed. They were in every respect similar to those found north of Nymagee, and mentioned in a previous paper (Part II). These trees can generally be at once detected by their bark, it being rougher than the Box and smoother than the Ironbark, and usually is somewhat of a yellowish-brown colour, especially towards the upper part of the trunk." (*Proc. Linn. Soc. N.S.W.*, xxvi, 324, 1901).

C.—Mr. Cambage is now between Barmedman and Temora :—

> The Eucalypts were represented by *E. Woollsiana*, *E. sideroxylon*, *E. melliodora* (increasing in quantity), *E. tereticornis* and var. *dealbata* (*E. dealbata*), one tree of *E. affinis*, and three of Ironbark Box similar to the reputed hybrid of Nymagee.
>
> *E. Woollsiana*, which is known locally as Black Box, was being cut for railway sleepers. Finding t on a ridge near Barmedman with *E. sideroxylon*, I searched a considerable area for the questionable

hybrid, and eventually found three trees fairly close together, with the bark, timber and fruits about midway between those of the other two, and corresponding with trees previously found in similar company (*vide* vol. xxv, p. 716, and xxvi, p. 324). I am still unable to offer any definite opinion as to what these trees really are. In a general way they seem to more nearly approach *E. sideroxylon* than any other local species, but the fruits are smaller, the bark less rough, and inclined to be like that of the Box, and the wood yellowish, while they seem too scarce to represent a distinct species. In this instance, as previously, they were only found as the result of special search. Although these trees appear to be very rare, it may be mentioned that in nearly every case they have been found in twos or threes. (R. H. Cambage, in *Proc. Linn. Soc. N.S.W.*, xxvii, 195, 1902).

I wrote as follows :—

The Ironbark-Boxes.—These seem to me to be indubitable hybrids. Mr. R. H. Cambage (these Proceedings, 1900, p. 715) has pointed out the probability of an Ironbark-Box of the Lachlan being a hybrid between *E. sideroxylon* and *E. Woollsiana*. He has also suggested the hybrid character of the Ironbark-Box or Bastard Ironbark of Nymagee, and the White Ironbark or Ironbark-Box of Barmedman; and I would add the Cooburn or Black Box of Narrabri. I only mention these forms because they have been referred to at some length in my paper on *E. odorata*, a species they closely resemble in bark, timber, buds, &c. The foliage of the Ironbark-Boxes is duller than that of *E. odorata*, and the venation less marked.

Mr. Cambage's observations as to the evolution of these forms are interesting, and must be borne in mind in considering the relations of the western " Boxes." I confine myself at this moment to emphasising the resemblance of these forms to *E. odorata*.

It is not desirable to name these forms until after further enquiries as to their relationship. Mr. R. H. Cambage writes to me :—" I should say that the Nymagee and Condobolin trees are associated with the narrow-leaved form of *E. Woollsiana*, and even the Barmedman ones are rather more the narrow forms that the broad, but it is getting difficult in the latter place." The " Narrow-leaved form of *E. Woollsiana* " is the form that, I recommend presently, should be known as *E. Woollsiana*, the broader-leaved forms really belonging, in my opinion, to *E. hemiphloia*. (*Proc. Linn. Soc. N.S.W.* xxix, 763, 1904).

Following is a description of *E. Barmedmanensis*, as complete as the material permits :—

A medium-sized tree.

Bark hard, tough, dark-coloured, flaky furrowed, so hard that portions do not rub off; the classification of it as an Ironbark Box is descriptive; it is hard, but not so furrowed as an Ironbark. The bark contains a good deal of kino.

Timber reddish brown; this is the colour after nearly twenty years' exposure, but it has darkened with age. It is hard and interlocked.

Juvenile leaves not seen.

Mature leaves dull green, and covered with fine dots, pedunculate, straight or rarely slightly falcate, not large, say up to 1 dm. long, and under 1·5 cm. in greatest width, tapering gradually into a fine but soft point, and gradually at the base into a petiole of 2 cm. Venation almost invisible, secondary veins making an angle of 30 deg. and more with the midrib; intramarginal vein fine and well removed from the edge.

Inflorescence in axillary pedunculate umbels up to 5 in the head on rather slender peduncles and pedicels; buds rostrate-ovoid, the rostrate or conical operculum varying in length. Although not seen mature, the anthers are evidently truncate.

Fruits about 5 mm. in diameter, nearly spherical to pear-shaped, tapering moderately sharply into a pedicel of under 5 mm. Rim of moderate thickness, with usually four or five blunt valves whose tips scarcely reach the orifice. Deciduous staminal ring.

The type is " White Ironbark, Barmedman, R. H. Cambage, No. 1 (4834), suggested by Mr. Cambage to be a hybrid between *E. sideroxylon* and *E. Woollsiana*.

I am of opinion that the following trees (to be further described immediately) come under *E. Barmedmanensis* :—

1. Trowel Creek, Nymagee.
2. Condobolin.

1. " Ironbark-Box " or " Bastard Ironbark," Trowel Creek, Nymagee (R. H. Cambage, May, 1900). This was looked upon by Mr. Cambage as a hybrid between *E. sideroxylon* and *E. Woollsiana.*

The tree has already been briefly described by Mr. Cambage. The bark is similar to that of Barmedman, except that it contains less kino. The timber similar to that of Barmedman. As regards the other characters (so far as the imperfect material is available) the only one calling for notice is the pointed character of both calyx-tube and operculum in the Trowel Creek specimens. It is very likely, however, that there is no important difference between the trees from the two localities in this and other respects.

2. Ironbark-Box, Condobolin (R. H. Cambage, 18th June, 1900). I have quoted Mr. Cambage's remarks (under B), and have referred to it in the following passage. It may be the Cooburn or Black Box of Narrabri, but my specimens are not very satisfactory, being in bud only.

" It appears to be the ' Ironbark-Box or Bastard Ironbark ' of Condobolin (R. H. Cambage); the Ironbark-Box or Bastard Ironbark of Nymagee (R. H. Cambage); the Cooburn or Black Box of Narrabri (Forester McGee). It is a tree which requires further investigation, the first work to be undertaken being a list of localities which produce timbers known as ' Ironbark-Box ' or ' Bastard Ironbark ' . . . .

" The ' Cooburn or Black Box ' is a tree that is often placed under *E. bicolor*, but in my opinion its place is with *odorata*. ' Cooburn, Black Box; Ironbark Box, Bastard Ironbark.' This tree is referred to in the following passage :—' Cooburn, Black Box (*Eucalyptus largiflorens*). Timber hard, tough and durable, very lasting underground, of a red colour. Used for fencing, rough buildings and sleepers. Habitat, stony ridges, scrub forests, N. and S. coast districts (*sic.*) 100–120′, 2–3′. Not very plentiful. N.S.W. Catal, Col. and Ind. Exh., p. 199. It has a hard, scaly, black bark." Maiden in *Journ. Roy. Soc. S.A.*, xxvii, 246 (1903.)

AFFINITIES.

From what Mr. Cambage wrote in 1900–2, it will be observed that he inclined to the view that the Box which is supposed to have entered into this hybrid is *E. Woollsiana,* though he points out that *E. melliodora* may or may not have a share. In Part XLVII, p. 199, of the present work, I have expressed the opinion that *E. Woollsiana* is a composite species and may include *E. odorata.* In 1903 I placed these hybrids under *E. odorata,* not that I believed them to be typical, but, as I did not wish to create another species, they seemed to come nearest to it, although at that time my views of *E. odorata* were not entirely what they are at present. As regards *E. sideroxylon,* we are both agreed that, if the trees be hybrids, that is probably one of the parents.

1. With *E. odorata* Behr. and Schlecht.

The timber was described as yellowish when freshly cut, but while it gets reddish-brown after the lapse of years, I think it may be fairly stated that when fresh it was never as pale as that of *E. odorata* or *E. melliodora,* nor, when old, as red as that of *E. sideroxylon.*

2. With *E. melliodora* A. Cunn.

The fruits are in shape and size and in the staminal ring a good deal like those of *E. melliodora*. There is some similarity to this species in buds also. The timber is a little darker than that of *E. melliodora*.

3. With *E. sideroxylon* A. Cunn.

The description of the timber after twenty years' exposure is reddish-brown, doubtless distinctly darker in colour than when freshly cut. I have heard of it being paler, but the cuts may not have been deep. The colour, in my view, is not in discord with the assumption that *E. sideroxylon* may be one of the parents. The fruits are smaller than those of *E. sideroxylon*, but show affinity to those of that species.

E. melliodora A. Cunn. var. (See fig. 3, Plate 216.)

Herewith are drawings which should be compared with the figures of *E. melliodora* at Plate 61, Part XIV. Besides the differences from that species already given, I would point out that the foliage is too rigid for normal *E. melliodora*, whose leaves are inclined to be thin, also the buds are more pointed, which may, or may not, show a tendency to *E. sideroxylon*.

Although I still believe it to be a hybrid, I do not propose to give it a name, because of its lack of distinctness, and therefore have named it *E. melliodora* var. for the present.

The specimen came from Murrurundi, New South Wales (J.H.M. and J. L. Boorman, May, 1902), and is referred to in *Proc. Linn. Soc. N.S.W.*, xxx, 495 (1905).

DESCRIPTION.

CCCII. × *E. Tenandrensis* Maiden, n.sp.

Reputed parents, *E. melliodora* A. Cunn., and *E. crebra* F.v.M.

An Ironbark, with hard timber of a pale brown colour, the foliage of a pale colour, and drying even paler.

Juvenile leaves not seen in the very earliest stage, but, in the early stage depicted in figs. 1*a*, 2*a*, Plate 217, broadly lanceolate, with a blunt apex, and tapering gradually into a long petiole, say 1 dm. long, by nearly 4 cm. in greatest width, and a petiole of 2 cm. Venation spreading, intramarginal vein at some distance from the edge; the venation not prominently but distinctly triplinerved.

Mature leaves narrow lanceolate, tapering gradually to the apex and less so to the petiole, slightly falcate, say 14 cm. long and 1 cm. broad, venation spreading, scarcely visible to the naked eye, the intramarginal vein a little removed from the edge.

Flowers.—Inflorescence in panicles, buds only seen in a young state, but with pointed opercula.

Fruits sub-globular, about 5 mm. in diameter, with a rim, the valves well sunk, pedicellate.

RANGE.

State Forest No. 166, Tenandra, parish of Baronne, land district of Coonamble, county of Leichhardt, western New South Wales (Forest Guard Withers, of Gilgandra).

AFFINITIES.

1. With *E. melliodora* A. Cunn.

This is another species having an affinity to *E. melliodora.* Its similarities are in the fruits, but to a less degree in the foliage. There is some similarity in the triplinervation, but the juvenile and intermediate leaves are much larger and paler in the new species than in *E. melliodora.* The new species is an indubitable Ironbark, with pale timber suggesting a resemblance to *E. melliodora* in that respect.

2. With *E. crebra* F.v.M.

The general appearance of the trunk of the tree closely resembles *Euc. crebra*, but seed capsules appear larger than those of this variety. The sucker leaves are very large, and the leaves somewhat glaucous in tint, thereby differing considerably from *Euc. crebra.* The timber has a high reputation locally. (Forest Guard Withers.)

The timber of *E. crebra* is red, thus sharply separating it from that of our new species, but in the adult foliage and fruits there is resemblance to the new species.

DESCRIPTION.

CCIII. × *E. Peacockeana* Maiden, n.sp.

A TREE of medium size, an undoubted Ironbark. "Inner bark and trunk, where contact is made with bark, are a brilliant yellow or saffron in hue." (L. Peacocke.)

Colour of timber yellowish to the palest brown.

Juvenile leaves.—The foliage throughout life is sap-green in colour, entirely glabrous and thinnish. The juvenile leaves are especially thin, narrow lanceolate;* venation for the most part indistinct, but the secondary veins, while spreading, mostly at an angle of 45 degrees with the midrib. The intramarginal vein is distinct, and is clearly removed from the margin.

Mature leaves linear-lanceolate, scarcely falcate, petiolate, with an average length of say 12 cm., with a width of about 1 cm.

Flowers, inflorescence axillary, up to five in the head, on slender peduncles of ·5 cm. supporting shorter pedicels, buds with conoid opercula, calyx-tubes of equal length, gradually tapering into the pedicels. The anthers have transition forms, varying from the truncate to those with the parallel cells (an indication of the instability of this form.)

Fruits small, about 5 mm. in diameter, almost pyriform, and with a narrow rim.

RANGE.

Elsmore, county of Gough, New South Wales. The type came from the base of a trap or porphyry ridge on Mr. H. R. Hughes' property, Elsmore Station, parish of Elsmore (Lance B. Peacocke, Forest Guard).

AFFINITIES.

1. With *E. melliodora* A. Cunn.

If the drawings be compared with those of *E. melliodora*, Plate 61 (Part XIV), it is impossible to fail to note that the resemblances of the mature leaf, fig. 3*a*, and also the buds and fruits are very great. In two important points the differences are so great, viz., in juvenile leaves, and the bark, that I feel justified in giving the tree a name. There is also some variation in the shape of the anthers that is worthy of note.

2. With *E. crebra* F.v.M.

"No other Ironbark tree of any species for many miles from this one, and no *E. crebra* for a distance of at least 15 miles." (L. Peacocke.)

Obviously in a distinct narrow-leaved Ironbark like this, we naturally think of *E. crebra*, but the red timber of that species at once separates the two. There are also differences in the anthers.

---

* Fig. 4 of Plate 61, Part XIV, under *E. melliodora*, shows a "very narrow 'juvenile' leaf, Lachlan River, N.S.W., J. Duff." This is a misprint for "mature" leaf, and it very strongly resembles in outline that of the juvenile leaf of our new species. Duff's specimen is a flowering branch.

DESCRIPTION.

CCCIV. × *E. Stopfordi* Maiden, n.sp.

Reputed parents, *E. melliodora* A. Cunn., and *E. sideroxylon* A. Cunn.

An Ironbark with pale-coloured timber, which is curly in texture in the specimens before me.

Juvenile leaves not seen in the earliest state. Intermediate leaves glaucous, thickish, rather broadly lanceolate, venation spreading, intramarginal vein well removed from the edge. A specimen 11·5 cm. long and 2·5 cm. in greatest width, tapering into a petiole of nearly 2 cm.

Mature leaves glaucous, thickish, venation spreading, inconspicuous, except the midrib and intramarginal vein. Lanceolate, usually bluntish at the apex, smallish, usually not much exceeding 8 cm. long, and 1·5 cm. in width.

Flowers.—Inflorescence paniculate, each peduncle bearing up to seven pedicellate flowers, the opercula short, conical, pointed, and commonly each with a second operculum; anthers obliquely truncate.

Fruits not seen.

RANGE.

This was sent from "near Inverell," New South Wales, by the late District Forester A. E. Stopford, and further particulars were not available through the state of his health, which not long afterwards culminated in his tragic death.

AFFINITIES.

1. and 2. With *E. melliodora* A. Cunn., and *E. sideroxylon* A. Cunn.

This is a puzzling form. In its timber, perhaps in the outline of its intermediate leaves, and certainly in its inflorescence, it resembles the former; in its bark, the colour and texture of its leaves, it resembles the latter. In the present state of our knowledge, therefore, there are grounds for the supposition that it may be a hybrid between the two.

DESCRIPTION.

CCCV. × *E. Forsythii* Maiden, n sp.

Reputed parents, *E. melliodora* A. Cunn., and an Ironbark (? *E. crebra* F.v.M.).

An Ironbark. Colour of timber not known.

Juvenile leaves not known.

Mature leaves dull green, lanceolate, scarcely falcate, tapering to the apex, and also gradually to the petiole, about 12 cm. in average length, and 2 cm. in greatest width, with a petiole of 1·5 cm., venation spreading, the intramarginal vein much removed from the edge, giving the leaf a triplinerved appearance.

Flowers.—No opercula on the specimens available, anthers obliquely truncate.

Fruits nearly hemispherical in shape, and 7 mm. in diameter, with a dark-coloured broadish rim, best seen on the top of the expanding orifice, and reminding one of the rim (and shape of fruit) of *E. hæmastoma.*

Named in honour of the late Mr. William Forsyth, for many years the respected Superintendent of the Centennial Park, Sydney.

RANGE.

On the Coonabarabran-Baradine road, Pilliga Scrub, New South Wales (William Forsyth, October, 1899).

AFFINITIES.

1. With *E. melliodora* A. Cunn.

It differs in the dull or glaucous foliage, but resembles *E. melliodora* in the mature leaves. There are, however, important differences in the fruits, and in the bark, for the new species is an Ironbark.

2. With *E. hæmastoma* Sm.

Under the description of the fruit I have a note as to its similarity to this species, but this appears the only similarity.

DESCRIPTION.

CCCVI. × *E. Auburnensis* Maiden, n.sp.

Reputed parents, *E. melliodora* A. Cunn., and *E. melanophloia* F.v.M.

An Ironbark, with yellowish inner bark, and pale-coloured timber.

Juvenile leaves glaucous, broadly lanceolate or almost lanceolate, say 6 cm. long by 4·5 broad, with a short petiole of 3 mm. Venation spreading or curved, intramarginal vein or secondary intramarginal vein at some distance from the margin, giving the leaf a triplinerved appearance.

Mature leaves glaucous or dull green, lanceolate, rarely falcate, tapering to a not very sharp apex; commonly 8 cm. long and 2·5 cm. broad in its greatest width; venation spreading, inconspicuous, intramarginal vein distinctly removed from the edge.

Flowers not seen.

Fruits only observed on the old wood, in umbels up to five, with slender peduncles and distinct, slender pedicels. Small (about 4 mm. in diameter), globular or slightly pear-shaped, tips of valves sunk beneath, or scarcely protruding beyond, the orifice, rim reddish-brown.

RANGE.

On Auburn Vale, county of Arawatta, near Inverell (Gordon Burrow, 28th October, 1907).

> I have never seen anything like them before; there is only a small clump of about thirty trees. They grow straight and fairly tall, and at a distance look like Stringybark, until one gets near enough to see the bark. Other trees in the vicinity were Apple (*Angophora subvelutina*), Yellow Box (*Eucalyptus melliodora*), Red Gum (*E. dealbata* (?)). There is no Stringybark or Ironbark within at least a mile. On the growing tree the bark looks almost like Wattle Bark. (Gordon Burrow, 28th October, 1907.)

This reference to Wattle Bark is to those species which have hard furrowed barks, almost like an Ironbark.

AFFINITIES.

1. and 2. With *E. melliodora* A. Cunn., and *E. melanophloia* F.v.M.

This is another species which seems to me to be a hybrid between *E. melliodora* on the one hand, and an Ironbark on the other. The assumed Ironbark in this case is *E. melanophloia*, which is unusual in this association, so far. The foliage is preponderatingly nearer to *E. melanophloia*, rather than *E. melliodora*, but *E. melanophloia* has a red timber; the colouration of the bark and timber much resembles that of *E. melliodora*.

3. With *E. hæmastoma* Sm., var. *micrantha*.

The only similarity appears in the red rim and shape of the fruits; as regards the red rim there is a note under *E. Forsythii*, but the fruit is larger in that case. We see the character also in *E. Tenandrensis*, but the rims of the proposed new species are thicker, and the fruits only observed (so far) on the old wood.

DESCRIPTION.

CCCVII. × *E. Yagobiei* Maiden, n.sp.

Reputed parents, *E. microtheca* F.v.M., and *E. hemiphloia* F.v.M. var. *albens.*

A Box. A glaucous foliaged tree of medium size, with a whitish, furrowed, fibrous-flaky bark on the trunk, the branches smooth. Timber pale-coloured, drying pale-brown.

Juvenile leaves shortly pedunculate, thickish, broadly-ovate, approximating 4 cm. in length and breadth, secondary veins fine, almost transverse, making an angle of about 60 degrees with the midrib, the intramarginal vein distinct from the edge.

Mature leaves shortly petiolate, coriaceous, narrow-lanceolate, symmetrical, the apex terminating in a blunt point, not much exceeding 1 dm. long, usually more than 1 cm. broad, venation inconspicuous when mature, much more conspicuous in the immature stages, secondary veins almost pennate, and making an angle of about 45 degrees with the midrib, the intramarginal vein distinct from the edge.

Flowers.—The inflorescence paniculate, the slightly flattened peduncles bearing umbels three-flowered or more, on distinct pedicels, the buds small, symmetrical, the opercula and calyx-tubes conoid, the greatest diameter under 4 mm. Anthers opening in parallel slits, small gland at top, usually becoming broader at the base. Filament attached at the base; not versatile.

Fruits hemispherical to pear-shaped, up to 5 mm. in greatest diameter, tapering somewhat abruptly to a pedicel, the valves (usually three) well exserted.

RANGE.

This is the tree of which I wrote three years ago—

> B. Bark white like a White Box (*E. hemiphloia* var. *albens*), but the foliage is like Silver-leaf Ironbark (*E. melanophloia*). All the surrounding trees are Silver-leaf Ironbark. This is the first tree of its kind I have noticed in this division. Parish Yagobie, county Burnett. (W. M. Brennan.) Again reporting on this tree, Mr. Brennan says: "Grows on a red ridge, well away from the river, and the only Coolabah (*E. microtheca*) tree I know of is about 5 miles away; this tree is somewhat similar in foliage to the tree in Mr. Solling's paddock (See A). (A. is *E. melanophloia*, and the tree is described at p. 70), but the bark is very different, being white like the White Box bark. Mr. District Forester Gordon Burrow has visited this tree, and confirms Mr. Brennan's observations. Excellent specimens are before me." (*Journ. Roy. Soc. N.S.W.*, liii, 71 (1919).)

The locality is northern New South Wales, on the banks of the Gwydir River.

AFFINITIES.

It is a question as to the affinity of this tree to *E. melanophloia*, or to *E. microtheca*. Its foliage is like *E. melanophloia*. I think its affinity is with *E. melanophloia*, but the timber is pale. I think we have a *melanophloia* hybrid, and as I am actively collecting data and materials in regard to Eucalyptus hybrids, I draw attention to what appears to be an interesting one. (Maiden, *op. cit.*, p. 71.)

1. and 2. With *E. microtheca* F.v.M., and *E. hemiphloia* F.v.M. var. *albens*.

I now think that the affinities of the suggested hybrid lie between these two species, and not with *E. melanophloia* F.v.M. For figures of the former see Plate 52, and of the latter see Plate 50. I think from *E. microtheca* the new form obtains its flowers, fruit (especially the fruit), and to some extent its foliage. From *E. hemiphloia* var. *albens* comes the bark and pale-coloured timber. From both assumed parents we have the glaucous foliage, but the size of its leaves is rather that of *E. melanophloia*.

DESCRIPTION.

CCCVIII. × *E. Blackburniana* Maiden.

Reputed parents, *E. odorata* Behr. and Schlecht, and (?).

This has already been described, under No. XLIV (*a*), " An Ironbark Box," in Part XI, p. 38 of this work, February, 1910, and figured figs. *a* to *i*, Plate 52.

As I suspected it to be a hybrid (see Part XI, p. 39) I did not give it a name, except in MS. (intending to name it with other hybrids), and only distributed it to Mr. R. T. Baker and to the Melbourne Herbarium. Mr. Baker inadvertently published the name in *Journ. Roy. Soc. S.A.*, xl, 478 (1916), which I presume is therefore the date of the species.

I named it in honour of John Blackburne, formerly Conservator of Forests of Victoria, who has long taken great interest in the elucidation of Victorian Eucalypts.

RANGE.

The type comes from Inglewood, Victoria (J. Blackburne, No. 14). I have seen imperfect specimens from the Wimmera, which are closely allied to, if not identical with, the Inglewood tree. I have not seen similar specimens out of Victoria, but it is reasonable to expect it from south-western New South Wales and middle-eastern South Australia.

AFFINITIES.

Those with *E. Bosistoana* F.v.M., and *E. bicolor* A. Cunn., are dealt with in Part XI, p. 39.

Its closest affinity seems to be to E. *odorata* Behr and Schlecht, near which I tentatively placed it (*op. cit.*, p. 38.)

DESCRIPTION.

CCCIX. × *E. Studleyensis* Maiden, n.sp.

Reputed parents, *E. rostrata* Schlecht, and *E. ovata* Labill.

An entirely glabrous, erect tree of considerable size, with rough, softish, friable bark, extending a considerable distance up the trunk and with smooth or ribbony bark beyond. Timber pinkish.

Juvenile leaves orbicular (say 4 cm. in diameter) to ovoid, thinnish, very shortly petiolate, venation transverse, spreading, the intramarginal vein looped and at a considerable distance from the edge.

Mature leaves moderately coriaceous, lanceolate, say 13 mm. long and 2·5 mm. in greatest width, venation spreading, the secondary veins making an angle of about 45 degrees with the midrib, the intramarginal vein distinct from the edge.

Flowers.—Inflorescence axillary, with umbels bearing up to seven flowers, on rather long slender peduncles and pedicels of half the length; buds smooth, operculum rostrate, of the same length as the calyx-tube, the anthers opening in parallel slits; the gland at the back versatile.

Fruits small (say 7 mm. in diameter), hemispherical or slightly campanulate, rim thin, and with the tips of the capsule slightly protruding from the orifice.

RANGE.

Studley Park, Kew, Victoria (A. D. Hardy, Forestry Commission, Melbourne). Mr. Hardy, who has studied this hybrid, and who first brought it under my notice, says that the neighbouring flora in the part of the Park containing the supposed hybrid, *i.e.*, near the top, in contradistinction to the river-flats, on a "red-bed capped spur which falls to the river (Yarra) has stunted but smooth-barked *E. viminalis,* close to the type, half-way down, in a valley, and has *E. rostrata* (typical) at the lower end of a little valley, and on a small flat, and at the river bank." There is rough-barked *viminalis* growing on the river flats.

AFFINITIES.

Mr. Hardy has raised seedlings from this reputed hybrid, and says they are reminiscent of *E. viminalis*, *E. rostrata* and *E. robusta* (?). It seems to me that the species closest to it are *E. rostrata* and *E. ovata*. *E. viminalis* seems to be less close, but those who desire to follow up this line of thought may refer to Part XXVIII, Plates 117, 118, 119.

1. With *E. rostrata* Schlecht.

See Part XXXIII, Plate 136. The buds of the supposed hybrid undoubtedly suggest *E. rostrata*; there is some, but less, similarity in the juvenile leaves as regards shape, but not in colour, those of *E. rostrata* being usually pale. The departure is increased as regards the fruits and timber.

2. With *E. ovata* Labill.

As regards *E. ovata*, see Part XXVII, Plates 113 and 114, but the buds are as a rule somewhat different, while the fruits of the hybrid lack that conoid appearance so common in *E. ovata*. The peduncles and pedicels are more slender in the hybrid, which seems nearest to *E. ovata* of any species.

3. With *E. leucoxylon* F.v.M.

The resemblance of the local *E. leucoxylon*, the foliage of which seems much less glaucous than is usually observable in the species, is evident. There is considerable similarity in the juvenile leaves, which, in the local *E. leucoxylon* seem to be broader, more reniform and more pointed than in *E. Studleyensis*. The buds of the two species are a good deal similar, but if figs. 3c., 4, 3, 6, Plate 56, Part XII, be turned to, it will be seen that the fruits are somewhat similar, but more urceolate in *E. Studleyensis*.

MISCELLANEOUS NOTES ON HYBRIDS.

I now give some notes on hybrids or reputed hybrids, which may be useful for reference. Very little attention has been given to the subject even yet, and I confidently predict that the botanist of the early future will repair this omission. Reference may be made to the hybrids to which names have been given for the species mentioned as reputed parents.

At a meeting of the Royal Society of New South Wales held on 5th November, 1919, I exhibited coloured drawings of the first hybrid Eucalypts that have been raised in Australia by the direct action of the plant-breeder. The Algerian and other hybrids hitherto described are the results of accidents, plants having been selected in the plantation that could only have arisen as the result of the proximity of certain pairs of species. Some of the reputed natural hybrids referred to in Australian literature may or may not be true; to say that they are so seems justified by the facts in regard to a number of them. These artificial hybrids are the work of Mr. C. J. Weston, Afforestation Officer, Federal Territory, Canberra. They are—

A.—*E. macrorrhyncha* x *Maideni*,

B.—*E. rubida* x *melliodora*, the former being the pollen parent in each case.

They were pollinated on 8th February, 1918, and 9th December, 1917, respectively. My specimen of "A." died in May last, when the seedling was 2 inches high. Of "B." I have two plants, 11½ and 12 inches high on 1st November, 1919. They will be described in detail on a future occasion.

1. E. AFFINIS Deane and Maiden.

The parents are assumed to be *E. sideroxylon* and *E. hemiphloia*, var. *albens*. See Part XIII, 101-3.

Fruits of this species may vary in size from 7 to 15 mm. in length. The average is about 10 mm. There are in the National Herbarium, Sydney, specimens which depart from the type. Amongst these may be enumerated—

(*a*) Murrurundi, N.S.W. (J. H. Maiden and J. L. Boorman, May, 1902), with leaves as small as those of the type and also much longer and broader. In these specimens the pedicellate character is emphasised. These trees grow in the vicinity of *E. melliodora*.

(*b*) Grattai, Mudgee district, New South Wales (J. L. Boorman and A. Murphy). In this district there are two forms, with small fruits as depicted in figures 4*a* and 4*b*, Plate 57, and one with leaves coarser than those of the type, and with fruits as large as those of the type, but globular, rather than pear-shaped.

2. E. Boormani Deane and Maiden.

See Part X, p. 330. This is assumed to be a hybrid between *E. siderophloia* Benth., and *E. hemiphloia* F.v.M.

3. E. calophylla R.Br., x E. ficifolia F.v.M.

Perez, Dr. G. V., 1919.—I had frequent communications with the late Dr. G. V. Perez, of Teneriffe, and have been long a believer that the puzzling colour-forms attributed to *E. ficifolia* were, at least, as regards some of them, to be attributed to hybridism with *E. calophylla.* I sent him seeds of several forms for experiment, and following are extracts from recent letters from him :—

> In order to preserve a very beautiful Eucalyptus hybrid which I am growing from seeds sent from Sydney as *E. ficifolia* (cherry coloured) (this is really *E. calophylla* var. *rosea*, J.H.M.), I am grafting by approximation, placing the stock in a large and long bamboo tube; the method succeeds very well, and I should say that to preserve any pretty shade of colour it will be valuable. I am going to employ as stock the hybrid *calophylla* x *ficifolia*, as *E. ficifolia* is much more delicate in the bad soil I have here, and besides the " cherry " I wish to preserve is a hybrid, which does not breed true from seeds. I have thought that what I have written may possibly be of some interest. (31st March, 1919.)
>
> I shall now endeavour to obtain several plants of one which you sent as *E. ficifolia*, and which is certainly a hybrid, often referred to in my correspondence with you as " cherry " colour, and most beautiful and floriferous, which began to flower when only four years old, and the progeny of which began to flower as early as two years old, some of them being white, some resembling the parent plant, and some rosy pink. The colour is so beautiful that it is worth while preserving by grafting by approximation, by the method above named, and grafting on its own stock; I have already two successfully grafted and planted out, but on (?) true *ficifolia*, which is not such a good stock.
>
> One of these days I am going to send you by sample post or perhaps by a postal packet, the capsules of the progeny of this tree, which are most variable and which, like the flowers, tell the story of its hybrid nature. (18th June, 1919.)

The untimely death (on 29th February, 1920) of this accomplished investigator put a stop to experiments which would doubtless have been very interesting. He was a confirmed believer in hybridism in the genus.

Some notes on *E. ficifolia* and *E. calophylla* will be found in this work, Part XLIII, pp. 78–81. See also a paper by myself " On a Eucalypt Hybrid (*E. calophylla* x *E. ficifolia*)," in *Proc. Linn. Soc. N.S.W.*, xli, 185 (1916).

Interesting results as regards the segregation of commercially valuable colour-forms would follow experiments on Mendelian lines.

4. E. Consideniana Maiden.

See Part X, p. 315. It is suggested to be a hybrid between *E. piperita* Sm. and *E. Sieberiana* F.v.M.

5. E. cornuta x Lehmanni Bourlier.

In Trabut, *Rev. Hort. de l'Algérie*, August, 1901, p. 239. A preliminary note only.

I have seen no details of this reputed hybrid.

6. E. FOELSCHIANA F.v.M.

I have already quoted Mueller's opinion that hybridisation may account for some of the forms to which *E. Foelschiana* belongs. (Maiden, *Trans. Aust. Ass. Adv. Science*, 1904, p. 303.)

7. E. GOMPHO-OCCIDENTALIS Hort.

8. E. GUNNII-GLOBULUS Hort.

They have both been distributed by MM. Vilmorin, Andrieux and Cie, are near *E. gomphocephala* DC. as far as fruits are concerned, but I have not seen complete specimens, and am therefore unable to criticise the nomenclature as indicative of the supposed parents.

9. E. HEMIPHLOIA F.v.M. x E. MELLIODORA A. Cunn.

Mr. A. D. Hardy refers to a reputed hybrid of *E. hemiphloia* x *melliodora*, between Stawell and the Grampians, in *Proc. Roy. Soc. Vict.*, xxix (new series), p. 169 :—

> On the way from Stawell to the Grampians, and near Brigg's Creek, on Rose's Gap road, there is, in a paddock lately occupied by Mr. Wills as a bee-farm and range, a tree which seemed to be a hybrid (*E. hemiphloia* x *E. melliodora*), with foliage, fruit and bark satisfying the requirements of the former, and with buds distinctly nearer the latter species. Both species grew in the district, but with no *E. melliodora* lately in the immediate neighbourhood. *E. melliodora* (Yellow Box) sometimes—frequently in the silurian country near Alexandra, &c.—assumes a drooping habit like *Salix babylonica*, or the Weeping Elm; many trees may be found aggregated in a locality, or scattered amongst those of more or less erect habit, but *E. hemiphloia* avoids this weeping habit entirely, so far as my experience goes.

Mr. Hardy proceeds to describe heterotropy (reversed direction of growth of a branch and branchlets) in this tree.

10. E. HYBRIDA Maiden.

See this work, Part XLII, p. 48. It is assumed to be a hybrid between *E. paniculata* Sm. and *E. hemiphloia* F.v.M.

11. E. INTERMEDIA R. T. Baker.

It was originally suggested as a hybrid between *E. corymbosa* Sm. and *E. maculata* Hook. See this work, Part XXXIX, p. 256, for Mr. Baeuerlen's original statement. Such a surmise explains some of the facts.

12. E. KIRTONIANA F.v.M.

Suggested parents, *E. robusta* Sm. and *E. resinifera* Sm.

Mueller in "Eucalyptographia," under both "*E. resinifera*" and "*E. robusta*," refers to a tree which partakes of the characters of both, and for which he proposes the provisional name of *E. Kirtoniana*. There are reasons for supposing that this tree is a hybrid, one of whose parents being probably *E. rostrata* (*robusta* in original; *rostrata* a misprint). (Maiden in *Trans. Aust. Ass. Adv. Science*, 1904, p. 302.) See Part XXIX of the present work, p. 203.

13. E. Kitsoniana (Luehmann) Maiden.

See Part XXVIII, p. 164.

I am of opinion that this may be a hybrid in which *E. ovata* Labill. plays a part.

14. E. Laseroni R. T. Baker,

which is assumed by me to be a hybrid between *E. eugenioides* Sieb., and *E. stellulata* Sieb. See Part XLVII, p. 188.

15. E. leucoxylon F.v.M. and (?) E. fasciculosa F.v.M.

Mr. Walter Gill, Conservator of Forests, Adelaide, sent me herbarium specimens, timber and bark, of an aberrant tree from Kuitpo, South Australia, with the following note :—" I send you a specimen of *E. leucoxylon* timber showing a very red heartwood, which I have only seen in this district, the northern Blue Gum (*E. leucoxylon*) being all one colour."

The herbarium specimens are obviously strongly akin to those of *E. leucoxylon* F.v.M. (They also resemble those of *E. sideroxylon* A. Cunn., but I do not know an individual of that species nearer than some hundreds of miles.) The timber is deep red, and the bark is somewhat fibrous (Box-like), characters rarely present in *E. leucoxylon.* It seems reasonable to look upon this rare plant as a hybrid, and as to the other parent, Mr. Gill suggests *E. fasciculosa* as likely. The points in which these specimens differ from *E. leucoxylon* could be supplied by *E. fasciculosa*, a red-timbered species abundant locally. (Maiden in *Proc. Linn. Soc. N.S.W.*, xxx, p. 497 (1905)).

16. E. longicornis F.v.M. x E. fœcunda Schauer.

The late Mr. Henry Johnston, Surveyor-General of Western Australia, told me that he had given the descriptive name of " Yorrel " to a supposed hybrid between York Gum (*E. fœcunda* Schauer) and the Morrel; it seemed to him to have the timber of the York Gum and the twigs of the Morrel.

I have not been able to obtain twigs of any of Mr. Brockman's or of Mr. Johnston's supposed hybrids, so I cannot express an opinion as to their botanical relationships, but I think it highly probable that hybridism does explain the puzzling variations to be referred to in regard to the Morrels. (Maiden in *Journ. Roy. Soc. N.S.W.*, xlix, p. 325, 1915.)

17. E. longicornis F.v.M. x E. occidentalis Endl.

The use of the name " Morrel," which is one of the most used names in Western Australia, is referred to in the present work, Part XV, pp. 166–7. It is usually applied to *E. oleosa* F.v.M. var. *longicornis* F.v.M.

Mr. Fred. Brockman, then Chief Surveyor of Western Australia, and whose knowledge of the trees of that State was very extensive, in an interesting interview, suggested hybridism in regard to the " Morrel." He suggests that the Yate (*E. occidentalis* Endl.) from the south coast of Western Australia and the Morrel from the eastern district of Western Australia (*E. oleosa* F.v.M., var. *longicornis* F.v.M.) probably have met say in the latitude of Katanning, and " from the common point of process of hybridising has proceeded spreading northward until Yate is lost in Morrel, and southward until Morrel is lost in Yate." (Maiden in *Journ. Roy. Soc. N.S.W.*, xlix, 325, 1915.)

18. E. Moorei Maiden and Cambage, and E. stricta Sieb.

In *Proc. Linn. Soc. N.S.W.* xxx, 200 (1905), Maiden and Cambage fully describe, under the letter B, a form that they assume to be a hybrid of the above two species.

19. E. mundijongensis Maiden.

In describing the above species in *Journ. Roy. Soc. N.S.W.*, xlvii (1913), I made the following observation at p. 225 :—

> When a tree is isolated, or very rare, there is a temptation to look upon it as a hybrid, and I have considered that view in the present case. It may be a correct one, but I do not know enough about its parents to emphasise the point. I believe it should have a name, and although I have a fair knowledge of Western Australian Eucalypts, it seems quite distinct from any, imperfect as my material is. Locally it is looked upon as allied to the Tuart, *E. gomphocephala* DC.

20. E. neglecta Maiden.

See Part XXVII, p. 151. I am of opinion that this may be a hybrid in which *E. ovata* Labill. takes a part.

21. E. Penrithensis Maiden.

It is assumed that this may be a hybrid between *E. eugenioides* Sieb. and *E. hæmastoma* Sm. var. *micrantha*. See Part XLVII, p. 215.

22. E. saligna Sm. and E. acaciæformis Deane and Maiden (?).

Mr. A. R. Crawford, Moona Plains, Walcha, sends me specimens with the following note :—" No. 5. Supposed hybrid between *E. saligna* and *E. acaciæformis* (Black Peppermint). The tree is from 60-70 feet in height, rough-barked from the ground to within 5 or 6 feet or less of the smallest twig ; in appearance the tree reminds me of the true *saligna*, although the bark resembles that of the " Black Peppermint.' "

The fruits of this tree are intermediate in size and shape, and the buds intermediate in size and shape between those of *E. saligna* and *E. acaciæformis.* The suggestion as to the hybrid origin appears reasonable enough. (Maiden in *Proc. Linn. Soc. N.S.W.*, xxx, 498, 1905).

On further consideration, I am less confident about this supposed hybrid.

23. E. Stuartiana F.v.M. and E. nova-anglica Deane and Maiden (?).

Seven miles east of Walcha (J.H.M.) we have a tree with Peppermint bark all up the trunk (bark of *E. nova-anglica*). Suckers narrower than those of *E. Stuartiana.* Fruits smaller than, but near to those of *E. Stuartiana.* Foliage intermediate in character between that of *Stuartiana* and *nova-anglica.* I am inclined to think this is a case of hybridism. (Maiden in *Proc. Linn. Soc. N.S.W.*, xxx, 499, 1905).

I have mislaid these specimens, and therefore cannot follow up this case of supposed hybridism.

24. E. tæniola R. T. Baker.

L. Rodway in *Proc. Roy. Soc. Tas.*, 12 (1917), says it seems probable that it is a hybrid between the Black Peppermint (*E. amygdalina*) and Mountain Ash (*E. Sieberiana*).

25. E. vitellina Naudin.

26. E. vitrea R. T. Baker.

I am of opinion that these are hybrids between *E. amygdalina* Labill. and *E. coriacea* A. Cunn. The matter has been discussed at some length in Part VI, pp. 164–166, 167 of the present work. See also observations by me in *Journ. Roy. Soc. N.S.W.* lii, pp. 516-518 (1918).

TIMBER.

Historical.—Early Attempts at Classification.

Governor Phillip was not enraptured with Eucalyptus timber. Four months after the foundation of the colony (of New South Wales, which took place January, 1788) he thus wrote (*vide* G. B. Barton) :—

> The timber is well described in Captain Cook's Voyage, but unfortunately it has one very bad quality, which puts us to great inconvenience; I mean the large gum-tree, which splits and warps in such a manner when used green, and to which necessity obliged us, that a storehouse boarded up with this wood is rendered useless.

The expedition landed in the middle of summer, the worst time, of course, for converting timber, while no one, a century and a quarter later, is likely to select timber for economic purposes which naturally grows on the shores of Port Jackson. Phillip, however, felt he had not been able to give the timber a fair chance, for he wrote a few months later—

> . . . Gum trees of a very large size, and which are only useful as firewood, though I think that when we can cut them down in the winter and give them time to season, they may be made useful in building. (Barton's *History of New South Wales*, i, 337.)

It cannot be said that early writers exaggerated the utility of Australian timbers. During the very month that Phillip wrote the first quoted statement, Major Ross wrote—

> . . . and I have no doubt but will, like the wood of this vile country when burned or rotten, turn to sand. This latter is a fact that has been proved . . . It is very certain that the whole face of it is covered with trees, but not one bit of timber have we yet found that is fit for any other purpose than to make the pot boil (*op. cit.*, i, 501.)
>
> An officer of marines wrote to Sir Joseph Banks, and summed up the matter thus : " These Gum-trees grow to an amazing size, but are scarce worth cutting down." (i, 504.)

The early colonists met with timber of a hardness and intractability to which they had been quite unaccustomed, and possessed very little food to supply the necessary muscular energy. The references to Australian Eucalyptus timbers in works published in the very early days were scant and indefinite, and are hard to interpret because of the imperfection of the nomenclature. It was long before even botanists tackled them because of the difficulties surrounding their classification.

The collection of New South Wales timbers by Caley (1800-1810) has been referred to at Part L, p. 308 (under Barks).

The vast majority of Australian timbers at present put to use are Eucalypts, and the discrimination of species precedes and dominates the state of our knowledge of these timbers. The botany of Eucalyptus has for long been obviously unsatisfactory, as can be gathered from the taxonomic portion of this work, but the co-ordination of knowledge in regard to the timbers was in far greater confusion. The use of vernaculars was rampant. Timbers were either exhibited under vernaculars (an honest method) or under vernaculars with botanical names " fitted on " to them, which sometimes was not honest, although there was no intention to deceive. The managers of our courts at International Exhibitions demanded botanical names, and the officer in charge of an exhibit did his best to oblige. And when it is pointed out that some timbers have a dozen vernaculars, and that the same vernacular may perhaps be applied to a dozen timbers, some idea of the position can be formed, or perhaps not. Many years ago I set out to do something to rectify a state of things which reflected no credit on any Australian State.

The scientific method (always the true method) was adopted, and one thing led to another. Firstly, in 1881, I set myself to gather together the scattered literature of Australian timbers, and this led to the compilation of my " Useful Native Plants of Australia " (1889), a pioneer work, followed by a " Bibliography of Australian Economic Botany " in 1892. Meantime this research led to my forming the timber collection of the Technological Museum, Sydney. For a reference to the earliest collections see my Annual Report of the Technological Museum, presented to Parliament for 1886, p. 16, and especially 1887, p. 24. The collections were based on material of ascertained botanical origin, with the view of reducing empiricism to a minimum. In my capacity as one of the New South Wales Commissioners for various International Exhibitions, I saw the old empirical methods in full swing, and because I could not convince my colleagues (worthy citizens, but few with scientific proclivities), that the way they were exhibiting our timbers was of very little practical value, and, because my desire to substitute authentic information for empiricism met with little response, I determined to throw my energy into the formation of the permanent referential timber collection already referred to.

The following preface to a paper read by me, by invitation, before the Engineering Association of New South Wales, and published in the " Building and Engineering Journal," Sydney, and also in the " Builders' and Contractors' News," of 25th May, 1889, shows that the serious investigation of the properties of New South Wales and Australian timbers is comparatively recent, although the period is a big slice in the working life of a man :—

> Systematic attempts to describe and classify our timbers date from the year 1855, the date of the Paris Exhibition, as it was only Tasmania (Van Diemen's Land, as it was then called) which used the Great Exhibition of 1851 to make known her native timbers. In the year 1854, for the display at Paris in the year following, the first serious attempt was made to gather our native timbers together, name, and give particulars concerning them. This work was delegated to Mr. (afterwards Sir) William Macarthur, who undertook the collection of timbers from what was called the " southern districts " of New South Wales, but which mainly comprised the counties of Cumberland and Camden, while Mr. Charles Moore, then, as now (I succeeded him in 1896—J.H.M.), Director of the Botanic Gardens, took charge of the " northern district," but his specimens came from what is now a portion of southern Queensland. These two gentlemen again co-operated for the London Exhibition of 1862, their collections in that exhibition being of enhanced value, partly by reason of their greater number, and partly because they were better named, owing to the advance of Australian botanical science in the interim. Queensland having become a separate colony since the previous exhibition, Mr. Moore substituted for his previous collection a large number of timbers chiefly from the Clarence River district of our colony. Since then, advantage has been taken to

exhibit New South Wales timbers at most of the principal International Exhibitions, but I regret to express the opinion that strangers to New South Wales have learnt but little of our timbers, for the reason that we have imparted so little information concerning them. There is no doubt that the conventional method of showing timbers at exhibitions is almost a useless one; if the object be simply to show the appearance of polished blocks, that might easily be attained by carefully colouring and graining pieces of some light and inexpensive wood which would lend itself to the process.

The fact of the matter is that exhibition collections are, as a general rule, required at too short a notice for justice to be done to timbers in regard either to variety or quality. Again, recommendations of this and that timber for this and that purpose have been freely made; many of them appear to be merely guesses, more or less judicious, and should be prefaced with the words "I think." But to rectify such statements, and to assess a timber at its true value takes a long time, perhaps longer than any other vegetable product. Under the direction of the Committee of Management of the Technological Museum, I have for the past three years been collecting logs of New South Wales timbers, with complete sets of herbarium material, in case any doubts should crop up. We have, up to date, nearly 130 logs 4 feet long, most of them of fairly large diameter. They have been cut at the proper season, are now undergoing seasoning, and at the proper time each will be sawn longitudinally into halves, one half displayed to show the nature of the wood, while the other will be, as far as possible, worked into various articles for which it has been pronounced by various writers to be suited. Pieces will also be available for the testing-machine. Now all this requires much time, and is a serious expense, but there appears to be no golden road to a knowledge of timbers any more than to any other branch of human knowledge. One of my reasons for coming here to-night is to ask members of this important Association to help in this national work of learning the truth about our native timbers. I would say to an individual member, "Keep the timber of a particular species under observation, making notes in regard to the experience of yourself, and trustworthy informants, as to its use and capabilities. Try to prove the truth or falsity of reports. But if the botanical name is not known to you already, it is in the highest degree important to collect flowering and fruiting specimens (usually most conveniently obtained by a gun), from a tree of the same kind. The reason of this is, of course, to give precision to your remarks, for if a tree is ever so valuable, it is obvious that it is of no use unless it can be identified." To the difficulty of identifying Australian trees unless botanical precautions have been taken, I have already alluded. I state a truism when I observe that our knowledge of Australian timbers is in its puling infancy, and I need not further apologise for these prefatory remarks, which are intended to show the state of the case, and thus engineers may see that the slightest observation, on authenticated timber, is worthy of record and will pave the way for a literature of the subject.

Modern Systems of Classification.

1892.—In a lecture delivered by me on 5th September, 1892, before the Sydney Architectural Association of New South Wales, entitled "Some of the Pale Hardwood Timbers of New South Wales" ("Building and Engineering Journal," Sydney, 10th September, 1892) I divided many of the Eucalyptus timbers (of New South Wales) into pale hardwoods, subdividing them into three groups—(*a*) hard, interlocked; (*b*) fissile; (*c*) inferior, such as Gums; which is a useful practical classification.

In (*a*) I included Grey or White Box (*E. hemiphloia*), Spotted Gum (*E. maculata*), Tallow-wood (*E. microcorys*), Blackbutt (*E. pilularis*), Mountain Gum (*E. goniocalyx*), Blue Gum of the southern ranges (*E. Maideni*).

In (*b*) the Stringybarks, *E. capitellata, macrorrhyncha, eugenioides, obliqua*, Mountain Ash (*E. Sieberiana*), White Ash (a tree we now know as *E. gigantea*), White Ash (later described as *E. fraxinoides*), Cut-tail (a tree we now know as *E. regnans* var. *fastigata*), Silver-top (a tree that probably is now known as *E. nitens*).

In (*c*) were grouped Peppermint No. 1 (*E. piperita*), Peppermint No. 2 (a tree now known as *E. radiata*), Messmate (*E. dives*), Manna Gum (*E. viminalis*), Apple Gum (*E. Stuartiana*).

1895.—In my "Notes on the Commercial Timbers of New South Wales" (first edition, 1895), at page 6, was submitted a classification (I give only the Eucalypts) of—

1. Ironbarks.
2. Pale Hardwoods.
3. Red Hardwoods.

1. *Ironbarks* of various kinds.

A table was given comparing—

E. paniculata (White or She Ironbark).
E. crebra (Narrow-leaved Ironbark).
E. siderophloia (Broad-leaved Ironbark).
E. sideroxylon (Red Ironbark).

2. *Pale Hardwoods*—

(*a*) Blackbutt (*E. pilularis*).
(*b*) White Mahogany (*E. acmenioides*).
(*c*) Tallow-wood (*E. microcorys*).
(*d*) Spotted Gum (*E. maculata*).
(*e*) Grey Box (*E hemiphloia*).

3. *Red Hardwoods*—

(*a*) Red Mahogany (*E. resinifera*).
(*b*) Grey Gum (*E. propinqua*).
(*c*) Murray Red Gum (*E. rostrata*).
(*d*) Forest Red Gum (*E. tereticornis*).
(*e*) Sydney Blue Gum (*E. saligna*).
(*f*) Woollybutt (*E. longifolia*).
(*g*) Bloodwood (*E. corymbosa*).

1896.—"New South Wales, the Mother Colony of the Australias," see p. 186. In my article on the Timbers of New South Wales in the same work, at p. 171, I divide the Eucalypts into "Ironbarks"; after these a convenient practical classification of our hardwoods is into "Pale Hardwoods," "Red Hardwoods" (both these comprising the commercial or best hardwoods of the colony) and the inferior or doubtful hardwoods (for lists consult paper).

1901.—In "The Forests of New South Wales," a lecture delivered before the Royal Society of New South Wales, and reported in the *Agricultural Gazette* of New South Wales for July, 1901, I propose the classification—Ironbarks, Boxes, Stringybarks, Pale Hardwoods, Red Hardwoods.

1902.—In *Journ. Roy. Soc. N.S.W.*, xxxvi, p. 319 (1902) I submitted the following notes on classification :—

1. *Gums.*—These timbers are short in the grain, dry to a brown or reddish colour, crack radially in drying, have many gum-veins, and, as a rule, lack durability. Their barks are smooth, and more or less ribbony. Examples : *stellulata, coriacea, hæmastoma, viminalis, Gunnii.* They connect with the "Boxes" (Bastard), and also with the smooth-barked members of the Jarrah Group.

2. *Mallees.*—Examples : *oleosa, Behriana, incrassata.* This is a group based on geographical considerations. They are arid country species, and connect the "Gums" and "Red Boxes."

3. *Ironbarks.*—These are fully described in my "Notes on the Commercial Timbers of New South Wales." They consist of (*a*) True Ironbarks, viz., *paniculata, siderophloia, crebra, sideroxylon*; (*b*) Bastard Ironbarks, timbers very similar to Ironbarks, but the barks belonging to the "Box" group. They consist of *Boormani* and *affinis; melanophloia* (and perhaps *microtheca*) connect the two groups.

4. *Boxes.*—These are tough, interlocked timbers, usually with fibrous bark on the trunk, and may be subdivided into :—

(*a*) Pale.—Examples : *hemiphloia, melliodora, Bosistoana, Baueriana, populifolia, quadrangulata, Cambagei* (*elæophora*), *goniocalyx, tesselaris, leucoxylon, corynocalyx* (*cladocalyx*), *globulus.*

(*b*) Red.—Examples : *bicolor, microtheca, polyanthema, odorata* (should be brown), *fasciculosa.* These two groups include some smooth barks or "gums," but their timbers are provisionally classified with the "Boxes."

(*c*) Bastard.—Examples : *Stuartiana, pulverulenta, Macarthuri, aggregata.* The timber of (*c*) is inferior and closely resembles that of the Gums.

5. *Stringybark Group.*—This includes a number of fissile timbers that pass into each other and may be subdivided as follows :—

(*a*) True Stringybarks.—Examples : *eugenioides, macrorrhyncha, capitellata, obliqua, Baileyana.*

(*b*) Blackbutts.—Examples : *pilularis* (which absolutely connects with the Stringybarks through its variety, *Muelleriana*), *acmenioides.* The most valuable timbers of the group.

(*c*) Peppermints.—Examples : *amygdalina, regnans, dives, piperita*; these timbers have gum-veins and are altogether inferior in quality.

Allied to these are :—

6. *Mountain Ash Group.*—Fissile timbers usually pale in colour, and with bark not so fibrous as the preceding. Example : *Sieberiana.*

7. *Tallow-wood and Spotted Gum.*—*E. microcorys* and *E. maculata*, two valuable pale-coloured timbers, *sui-generis.*

8. *Bloodwoods.*—These have gum-veins and are coarse grained; *corymbosa* is red, and *eximia* and *trachyphloia*, which are pale, connect with *maculata.*

9. *Jarrah Group.*—Containing a number of heterogeneous species, and which I name after the best known member. Some have fibrous barks, others are smooth, but they are all deep red, durable timbers. Examples: *marginata, resinifera, diversicolor, propinqua, punctata, saligna, botryoides, robusta, tereticornis, rostrata, longifolia,* This group connects with the Red Boxes.

1904.—"Notes on the Commercial Timbers of New South Wales," (2nd edition, 1904). In this edition I submitted a classification—

1. *Ironbarks.*

2. *Stringybarks,* including—
   White Stringybark (*E. eugenioides*).
   Red or Coast Stringybark (*E. capitellata*).
   Red or Mountain Stringybark (*E. macrorrhyncha*).
   Messmate or Stringybark (*E. obliqua*).

3. *Pale Hardwoods*—
   - (*a*) Mountain Ash (Mountain form of *E. obliqua*, subsequently ascertained to be *E. gigantea.* Also *E. Sieberiana* and *virgata* var. *altior* (*E. altior* or *E. oreades*)).
   - (*b*) Blackbutt (*E. pilularis*).
   - (*c*) White Mahogany (*E. acmenioides*).
   - (*d*) Tallow-wood (*E. microcorys*).
   - (*e*) Spotted Gum (*E. maculata*).
   - (*f*) Grey Box (*E. hemiphloia*).
   - (*g*) Some other pale-coloured Boxes of secondary importance—
     - A. Yellow Box (*E. melliodora*).
     - B. A Yellow or Bastard Box (*E. Bosistoana*).
     - C. A Box (*E. quadrangulata*).
   - (*h*) Some miscellaneous pale timbers—
     - A. Mountain Gum (*E. goniocalyx*).
     - B. Bundy or Mountain Apple (*E. Cambagei*, since ascertained to be *E. elæophora*).
     - C. A Blue Gum (*E. Maideni*).
   - (*i*) Boxes of intermediate colour—
     - A. Round-leaf Box or Fuzzy Box (*E. Baueriana*).
     - B. Bimble Box (*E. populifolia*).
     - C. Ironbark Box, Mallee Box (*E. odorata*).

4. *Red Hardwoods*—
   - (*a*) Red Mahogany (*E. resinifera*).
   - (*b*) Grey Gums (*E. punctata* and *E. propinqua*).
   - (*c*) Murray Red Gum (*E. rostrata*).
   - (*d*) Forest Red Gum (*E. tereticornis*).
   - (*e*) Sydney Blue Gum (*E. saligna*).
   - (*f*) Woollybutt (*E. longifolia*).
   - (*g*) Bloodwood (*E. corymbosa*).

   - (*h*) Red Boxes—
     - A. Red Box or Slaty Gum (*E. polyanthemos*).
     - B. River Box, Drooping Box (*E. bicolor*).
     - C. Coolibah (*E. microtheca*).

1905.—"Forestry in New South Wales." University of Sydney Extension Lecture. Reported in the *Agricultural Gazette, N.S.W.*, for December, 1905, p. 1185.

In this lecture, at page 1193, I made new suggestions for classification. I suggested a new grouping of Blackbutt, Pale Box, and (amplifying my 1902 suggestion), I suggested that the name Jarrah should include a number of red timbers, including Grey Gums, Forest Mahogany, Woollybutt, Blue Gums, the Red Boxes and the Red Gums. Such a suggestion as this is worthy of consideration if the question of the reduction of the number of names for somewhat similar timbers on this continent is to be gone into.

Blackbutt. I made this term include :—

E. pilularis (the true Blackbutt).

E. acmenioides and *E. umbra* (two kinds of White Mahogany).

E. goniocalyx (Mountain Gum).

Pale Box. I made this term include :—

E. hemiphloia (White or Grey Box).

E. Baueriana (Fuzzy Box.)

E. Bosistoana (South Coast Box).

E. quadrangulata (A Box).

E. melliodora (A Yellow Box).

Fissile specimens of the Pale Boxes may approximate in texture to the Blackbutts.

Jarrah. I would make this term include :—

A. *E. punctata* and *E. propinqua* (Grey Gums).
   E. resinifera (Forest Mahogany).
   E. longifolia (Woollybutt).
   E. saligna (Blue Gum).

B. The Red Boxes—

E. polyanthemos (Red Box or Slaty Gum).
E. Rudderi (Coast Red Box).
E. bicolor (Black or Flooded Box).
E. fasciculosa (really *intertexta*) (Western Red Box).

C. The Red Gums—

E. rostrata (River Red Gum).
E. tereticornis (Forest Red Gum).

1914.—In the New South Wales Handbook (prepared for the visit of the British Association, 1914), p. 440, I briefly classified the species of that State as follows:—

Ironbarks.
Stringybarks.
Woollybarks.

(By this term I referred to barks which are matted and comparatively smoothish externally, not with the fibres longitudinally disposed and coarse, as in the preceding section. This is a large group, which includes Blackbutts, Ashes, Peppermints, Boxes.)

Bloodwoods.
Gums.
Mallees.
Other dwarf species.

In the Federal Handbook (prepared for the visit of the British Association, 1914), p. 187, I stated that the timbers of Eucalyptus may, as regards colour, be roughly divided into red, brown, and pale.

I shall have something more to say on this very important matter of classification when I come to the question of nomenclature, which will be separately considered in the present Part, p. 136.

1917.—"Australian Eucalyptus Timber," R. T. Baker, *Official Year-book*, x, 85 (1917).

Mr. Baker's classification is as follows:—

1. Ironbarks.
2. Gums.
    (*a*) Pale-coloured woods.
    (*b*) Red coloured timbers.

(*E. leucoxylon* has been admitted into this group in error, and *E. redunca* is not a true red wood. J.H.M.)

3. Tallow-wood.
4. Stringybarks.

5. Ashes. These include *E. gigantea* (*E. delegatensis*). *E. fraxinoides*, *E. Sieberiana*, *E. oreades*.
6. Blackbutts. *E. patens*, the W.A. Blackbutt, is added to the eastern *E. pilularis*.
7. Mahoganies—
   - (*a*) Pale (*E. acmenioides* and *E. umbra*.)
   - (*b*) Red (*E. resinifera*, *E. marginata* (Jarrah)).
8. Boxes—
   - (*a*) Pale. This is made to include *E. Boormani*, *E. microtheca*, *E. bicolor* (which are certainly not pale. J.H.M.).
   - (*b*) Red. This is made to include *E. Bosistoana* and *E. populifolia* (which are certainly not red. J.H.M.).
9. Bloodwoods.
10. Peppermints.

1919.—" The Hardwoods of Australia and their Economics," by R. T. Baker.

In this work the classification of 1917 does not appear to have been disturbed, but at p. 5, a classification, based on colours, is introduced (see Colours below), and at p. 383 one of grades of hardness.

Colours.

Although colours have already been casually referred to, there is a practical convenience in giving the literature of the subject as regards colours, so far as I know it.

The comparison of the colours of timbers is not easy, since sometimes they are noted when newly cut, and sometimes when seasoned. As a rule, the timber is judged as regards colour when seasoned, but, if the colours when fresh could be ascertained in addition, the records would be more useful. Some of the colours of timbers are apparently discrepant because the freshly cut timbers of some are compared with the colours of seasoned timbers of others. At the same time, I have quoted colours of freshly cut timbers whenever I could ascertain them.

The colour of timber usually darkens and gets duller with age. As a rule, the timber of a young tree is paler in colour than that of an older one.

A chemical investigation of Eucalyptus timbers from the point of view of presence or absence of colouring matter has not, so far as I am aware, been undertaken.

I have briefly referred to colouration under Barks in Part LII, p. 104, and the colour of the inner bark is frequently transmitted more or less to the timber.

What is known as Heartwood consists of dead cells, the cavities of which as a rule are blocked up by gums or other substances which, being more or less saturated with tannins, are usually of a dark colour.

The following passage is suggestive :—

The Accumulation of Waste in Wood.—In many trees the heartwood serves as a reservoir of various excreta which may give it a colour different from that of the sapwood, as in the Red Cedar (*Juniperus Virginiana*), and in the Black Walnut. The coloured heartwood is usually much harder than the white sapwood (as in Mahogany and Ebony), whence the significance of the name *duramen*. Occasionally the medulla is a reservoir of excreta, as in the sumac, which is coloured yellow. Doubtless the chief advantage of the accumulation of such substances in the duramen is that thus they are removed from the active tissues, though it is an important subsidiary advantage that they increase the durability of the heartwood and thus promote longevity. ("Text-book of Botany," Coulter, Barnes and Cowles, ii, 725.)

The literature on the subject of colour in timber is not abundant, and attention may be invited to "Récherches sur la determination des bois exotiques colorés d'apres les caractères chimiques et spectroscopiques," par M. A. Jauffret (*Ann. du Musée Colonial de Marseille,* 1920, pp. 163). It is a valuable paper, but chiefly refers to the timbers of the French colonies, a number of which are not cited by botanical names. There is a useful bibliography of the subject. No Eucalyptus timbers are mentioned.

Following is the first attempt to classify Australian timbers by colours :—

Maiden, 1892.—"Some of the Pale Hardwoods of New South Wales." Read, by invitation, before the Sydney Architectural Association, and published in the *Building and Engineering Journal*, 10th September, 1892.

Following is an extract :—

I have not, however, seen our hardwoods grouped according to colours, but I think that such a classification will be found useful, and, as our knowledge extends, degrees of difference in colour between our various hardwoods will be found which are scarcely appreciated at present. I propose this evening to deal with such of our hardwoods as are free, or almost free, from a reddish tinge, and which vary in colour when quite fresh, from white to a very pale brown. For precision I shall confine my remarks to the products of the genus Eucalyptus, which, of course, includes the vast majority of our hardwoods. Treat it as one will, the subject remains a difficult one if it be done with any approach to thoroughness. (Here follow some notes in regard to the use of vernaculars and botanical names for the timbers of commerce, see p. 141). . . . I would like to remind architects, in passing, that there is some kudos to be obtained in designing furniture to be constructed out of our hardwoods. I particularly allude to such massive furniture as tables, settees, &c. In large houses in Europe, such furniture is often made of oak, where weight is not considered an object, and I think that some of our hardwoods may well be utilised as oak-substitutes. I may remind you that one of our pale hardwoods, White Ash, is pretty extensively used in Sydney already as a substitute for English and American Ash, and it is particularly suitable for bedroom furniture, presenting an excellent appearance. In classifying the pale hardwoods of this colony, it is not possible to draw a hard-and-fast line between the pale ones and those which are not pale, but I hope eventually to be able to give a scale of timber-colours. I have divided our New South Wales pale hardwoods into three groups, viz : —

1. Hard, interlocked timbers;
2. Fissile timbers;
3. Inferior timbers;

which I submit as a practically useful classification.

The classification will be found in brief detail at p. 130.

Maiden, 1895.—In my "Notes on the Commercial Timbers of New South Wales," (First edition, 1895), I reiterated the classification of Pale Hardwoods, and added that of Red Hardwoods for the first time (see p. 131). Although, so far as I know, I may have used the terms Pale and Red for the first time in a scientific classification, I have known timber-men to use these terms as a general classification as long as I can remember. Governor Phillip's woodcutters must have noticed these extremes of colours.

Cambage, 1913.—Mr. R. H. Cambage, in his presidential address (*Proc. Roy. Soc. N.S.W.*, xlvii, 34, 1913), refers to the colour of timbers in the following words:—

> In studying the dark and pale-coloured timbers, it is noted that in the warmer parts both colours occur, while in the Mountain Region, above an altitude of 3,500 feet in latitude 32 degrees, and at diminishing elevations to the southward, the prevailing colour of Eucalyptus timbers is pale, no red-timbered Eucalypt occurring in Tasmania (R. T. Baker and H. G. Smith make some reference to this subject in *Proc. Roy. Soc. Tas.*, p. 139, 1912). The colouring of dark timbers is evidently due to the presence of some constituent, perhaps developed in response to a plant food, and it seems not improbable that the development of the substance in question is retarded by the cold. The wood of mountain Eucalypts is also regarded as the least valuable for firewood among the genus, which fact implies some difference in the composition of many lowland and highland Eucalyptus timbers.

Baker, 1913.—In "The Cabinet Timbers of Australia," by R. T. Baker (1913), a few Eucalyptus timbers are shown in colour. They are admirable, and it is to be regretted that more species are not figured, and more specimens of each to show variation. Those figured are—

Plate XXX.—Mountain Ash or Tasmanian Oak (the latter a misleading trade name, but in use) (*E. gigantea*, given as *E. delegatensis*); a Stringybark (*E. obliqua*); Red Mahogany (*E. resinifera*); Jarrah (*E. marginata*); a Red Box (*E. Rudderi*); Spotted Gum (*E. maculata*); Sydney Blue Gum (*E. saligna*); Slaty Gum (*E. Dawsoni*).

In the same year, in dealing with Victorian Timber Trees at p. 307 of *Report Aust. Assoc. Adv. Science*, Mr. Baker says, "No less than seven-eighths of the sixty trees described in this paper are pale-coloured. The red timbers are, therefore, comparatively few, and number less than a dozen." He offers the classification:—

Heavy—

(*a*) Red-coloured timbers—*E. croymbosa, E. botryoides, E. polyanthemos, E. rostrata, E. tereticornis, E. longifolia, E. sideroxylon.*

(*b*) Pale-coloured timbers—*E. goniocalyx, E. hemiphloia, E. melliodora, E. Bosistoana, E. albens* (*hemiphloia* var. *albens*), *E. Fletcheri* (*Baueriana*), *E. Behriana.*

Medium—

Pale-coloured—*E. paludosa* (*ovata*), *E. globulus, E. pilularis, E. amygdalina* (*radiata*), *E. Muelleriana, E. eugenioides, E. capitellata, E. macrorrhyncha.*

Light—

Pale-coloured—*E. delegatensis* (*gigantea*), *E. regnans, E. obliqua, E. piperita*

Maiden, 1914.—The use of the designation " Brown " seems to have been omitted from classification until 1914, when (Federal Handbook for the British Association Meeting, p. 187) I suggested their grouping into red, brown, and pale, and added the following brief note :—

> Red timbers may be found both in the interior (*e.g.*, *E. rostrata* Schlecht, *E. microtheca* F.v.M., *E. salmonophloia* F.v.M.), or in the comparatively well-watered coastal districts (*E. marginata* Sm., *E. resinifera* Sm., *E. saligna* Sm.); but in the dry districts of eastern Western Australia, the timber is nearly always cigar-brown in colour. The pale timber (*e.g.*, *E. pilularis* Sm., *E. microcorys* F.v.M., *E. gomphocephala* DC.) is mainly found in well-watered districts.

In the New South Wales Handbook for the British Association, p. 440, I emphasised the reference to brown timbers a little more—

> Others may be brownish of shades, such as Blue Box, *Baueriana*; Grey Box. *hemiphloia*; Shiny-leaved Box, *populifolia*. Some are very pale, almost white, such as Blackbutt, *pilularis*; New England Blackbutt, *Andrewsi*; Mountain Ash, *Sieberiana*, *gigantea*; but a hard-and-fast line cannot be drawn between the pale and the brown ones.

Baker, 1917.—In *Proc. Roy. Soc. N.S.W.*, li, p. 410, with Plate XX, Mr. R. T. Baker uses colour in the discrimination of some of the Ironbarks, but in my view the colour-photographs are not quite satisfactory. My observations as to the unsatisfactoriness of using colour for diagnostic purposes in these Ironbarks, are given in Part XLVIII, p. 225, of the present work.

To the notes on variation in timber there given, may be added the following reference to *E. Andrewsi*—

> Varies very much in quality according to soil and altitude. Timber growing on granite formation, and at a high altitude, is pale in colour and harder than the same timber at a lower altitude on soil of a basaltic formation. Where growing on the latter, the timber generally is a pale brown colour, denser and heavier than the former. (Forest Guard N. Stewart, Glen Innes district.)

Baker, 1919.—In Mr. Baker's " Hardwoods of Australia," at p. 3, we have some preliminary remarks on colour, and the following are extracted from his list of timbers under the various headings. I have collected the nomenclature adopted by Mr. Baker.

1. Dark Red.

E. affinis.
E. Cambageana.
E. Dawsoni.
E. Fergusoni (paniculata).
E. longicornis.
E. marginata.
E. microtheca.
E. polyanthemos.
E. punctata.
E. redunca.
E. resinifera.
E. rostrata.
E. salmonophloia.
E. siderophloia.
E. squamosa.

2. Red.

E. botryoides.
E. cornuta.
E. crebra.
E. Deanei.
E. diversicolor.
E. Griffithii.
E. hemilampra (*resinifera.*)
E. intermedia.
E. longifolia.
E. melanophloia.
E. Nanglei (*paniculata*).
E. patentinervis (*Kirtoniana*).
E. propinqua.
E. populifolia.
E. robusta.
E. saligna.
E. tereticornis.

3. Pink.

E. Benthami.
E. bicolor.
E. Jacksoni.
E. Laseroni.
E. macrorrhyncha.
E. Macarthuri.
E. rubida.
E. viminalis.

4. Grey.

E. calophylla.
E. maculata.
E. paniculata.

5. Chocolate.

E. Beyeri.
E. Clelandi.
E. Le Souefii.
E. loxophleba (*fœcunda*).
E. tesselaris.

6. Yellow.

E. Fletcheri (*Baueriana*).
E. globulus.
E. gomphocephala.
E. goniocalyx.
E. hemiphloia.
E. microcorys.
E. Muelleriana.
E. patens.

7. Pale.

E. acervula (*ovata*).
E. acmenioides.
E. albens (*hemiphloia* var. *albens*).
E. amygdalina.
E. angophoroides.
E. australiana (*radiata*).
E. Banksii.
E. Bosistoana.
E. Brownii.
E. campanulata (*Andrewsi*).
E. Cannoni.
E. capitellata.
E. carnea (*acmenioides*).
E. delegatensis (*gigantea*).
E. dextropinea (*Muelleriana*).
E. eugenioides.
E. fastigata (*regnans*).
E. Guilfoylei.
E. Jacksoni (also under Pink).
E. lævopinea.
E. leucoxylon.
E. Muelleri.
E. Maideni.
E. melliodora.
E. Mundijongensis.
E. oreades.
E. pilularis.
E. piperita.
E. Planchoniana.
E. quadrangulata.
E. Rodwayi (*aggregata*).
E. scoparia.
E. Sieberiana.
E. umbra.
E. virgata (*Sieberiana*).
E. Wilkinsoniana (*eugenioides*).

8. White.

E. Dunnii.	*E. nitens.*
E. fraxinoides.	*E. regnans.*

Maiden, 1921.—Here follows the classification I submit as a practicaly useful one.

It will be seen that my scheme is mainly based on colour. Other characters of ready application are fissility and its opposite (interlockedness), weight and hardness. It does not seem safe in the present state of our knowledge, and in the absence of detailed information, to bring in other factors.

No doubt some of the descriptions are similar to others in somewhat different verbiage, but, where possible, I have quoted the actual words of different authorities, or made by me at the time.

There is a certain amount of parallelism with the bark classification, but, in the present state of our knowledge, perhaps not much, and it has to be applied with care.

The normal colour of Eucalyptus timber is pale (" white "). The browns and the reds are due to tannins. The dull cigar-brown timbers of the interior I look upon as a later oxidation stage of the reds.

The Timbers may be provisionally arranged as follows:—

0. Mallees.
1. Pale Hardwoods—
    - A. Peppermint.
    - B. Mountain Ash.
    - C. White Mahogany.
    - D. Blackbutt.
    - E. Stringybarks.
    - F. Coriaceæ.
    - G. Brittle Gums, pinkish when newly cut:—
        - (*a*) Gums.
        - (*b*) Half-barks.
        - (*c*) Rough barks.
    - H. Pale inlocked timbers.
2. Brown Hardwoods.
3. Red Hardwoods—
    - A. Red Gums.
    - B. Blue Gums.
    - C. Grey Gums.
    - D. Red Box.
    - E. Mahogany.
    - F. Woolly Butt.

4. Ironbarks.
    A. Ironbark-Boxes.

5. Bloodwoods.
    A. Red.
    B. Pale.
        (*a*) *E. setosa* group.
        (*b*) Moreton Bay Ashes.
        (*c*) *Eudesmiæ.*

6. Western Australian Hardwoods.
    A. Pale brown.
    B. Dull cigar-brown.
    C. Red.

0. MALLEES.

These are listed at p. 321, Part 50, and, as a rule, are too small to be enumerated as timber. I have, therefore, not repeated the lists.

1. PALE HARDWOODS.

Nos. A. to F. belong to the Renantheræ, and are more or less fissile.

Amongst the Renantheræ, *E. hæmastoma* (a White Gum) has been transferred to the Pink timbers.

E. microcorys (Tallow Wood) and *E. Planchoniana* have been transferred to the Pale inlocked timbers.

This section includes—

A. Peppermint (9 species).
B. Mountain Ash (6 species).
C. White Mahogany (2 species).
D. Blackbutt (1 species).

A. PEPPERMINT—

E. amygdalina Labill.
E. Andrewsi Maiden.
E. Consideniana Maiden.
E. dives Schauer.
E. linearis Dehnh. (Very little rough bark.)
E. numerosa Maiden.
E. piperita Sm.
E. radiata Sieber.
E. tæniola Baker and Smith.

These are trees with what is known as the "Peppermint" bark, and characteristics of the timber are paleness (not always as pale as Mountain Ash), liability to gum-veins, and a medium fissility, with low durability in the ground. Some of them have satisfactory durability for situations which do not involve contact with the earth.

E. AMYGDALINA Labill.

Pale, durable, with the limitations referred to.

E. ANDREWSI Maiden.

Pale to pale-brown, has gum-veins; durable.

Mr. Forest Guard N. Stewart, of Glen Innes, New South Wales, reports:—

> This Blackbutt varies very much in quality according to soil and altitude, as I find that this timber growing on granite formation and at a high altitude is pale in colour and harder than the same timber at a lower altitude on soil of a basaltic formation. Where growing on the latter, the timber is generally of a pale brown colour, denser and heavier than the former, and the bark is of a more fibrous nature. It appears to be very subject to gum-veins, although not to such an extent as to injure the timber.

E. CONSIDENIANA Maiden.

Pale-coloured, liable to gum-veins, inferior in durability; resembles *E. piperita* a good deal.

E. DIVES Schauer.

Pale, full of concentric kino veins.

E. LINEARIS Dehnh.

Pale and moderately fissile. This is a true Gum (Leiophloiæ), and not a Half-bark (Hemiphloiæ).

E. NUMEROSA Maiden.

Pale-coloured, very fissile. Tough when freshly cut, but afterwards of inferior strength.

E. PIPERITA Sm.

Pale-coloured, with gum-veins, deficient in strength and durability, and only used in default of better timber.

E. RADIATA Sieber.

Pale-coloured, moderately fissile and durable.

E. TÆNIOLA (Black Peppermint of Rodway) Baker and Smith.

Moderately fissile.

B. MOUNTAIN ASH—

E. fraxinoides Deane and Maiden.
E. gigantea Hook. f.
E. oreades R. T. Baker.
E. regnans F.v.M.
E. Sieberiana F.v.M.
E. Smithii R. T. Baker.

As compared with the Peppermints, this section flourishes in colder climates. The timbers are paler, often almost white, and some are remarkably fissile. They are comparatively light in weight, and include some useful furniture woods, particularly for bedrooms.

To show how puzzling the use of vernacular names is, we have the name Peppermint in use also for Brittle-Gums (sub-sections Half-barks and Rough-barks), to mention no others.

E. FRAXINOIDES Deane and Maiden.

Pale-coloured, light in weight, fissile, tough.

E. GIGANTEA Hook. f.

Very pale, very fissile, of especial merit.

E. OREADES R. T. Baker.

Pale-coloured, rather soft, fissile.

E. REGNANS F.v.M.

Sometimes also known as Blackbutt. Pale, very fissile.

E. SIEBERIANA F.v.M.

Pale-coloured, moderately fissile.

E. SMITHII R. T. Baker.

Pale, moderately fissile.

C. WHITE MAHOGANY—

E. acmenioides Schauer.
E. umbra R. T. Baker.

These are intermediate in character between the two preceding groups, and Blackbutt (*E. pilularis*). *E. umbra* may be looked upon as an inferior quality of *E. acmenioides*. The best White Mahogany sometimes resembles Tallow-wood (*E. microcorys*).

E. ACMENIOIDES Schauer.

Pale-coloured, dense, somewhat fissile and durable. Often resembles *E. microcorys* somewhat.

E. UMBRA R. T. Baker.

Pale and somewhat resembling the preceding.

D. BLACKBUTT—

E. PILULARIS Sm.

Pale-coloured, more or less fissile, durable. It is usually readily diagnosed by the presence of narrow, concentric gum-veins, but sometimes these gum-veins are nearly or wholly absent. As a rule, they are too narrow to cause deterioration.

E. STRINGYBARK—

E. Blaxlandi Maiden and Cambage.
E. capitellata Sm.
E. eugenioides Sieb.
E. lævopinea R. T. Baker.
E. macrorrhyncha F.v.M.
E. Muelleriana Howitt.
E. obliqua L'Herit.
E. Penrithensis Maiden.

All distinctly fissile, although not so much so as the most fissile of the Renantheræ. All well-grown trees yield valuable timber. Colour of timbers varying from "not white" to brownish and reddish brown, *i.e.*, becoming darker coloured than most of the Renantheræ. It is not easy to make distinctive remarks in regard to the various Stringybarks. The names are not always distinctive.

E. Blaxlandi Maiden and Cambage.

Closely allied to the next.

E. capitellata Sm.

Brown Stringybark.

E. eugenioides Sieb.

White Stringybark.

E. lævopinea R. T. Baker.

A silver-leaved Stringybark.

E. macrorrhyncha F.v.M.

Red Stringybark.

E. Muelleriana Howitt.

Yellow Stringybark.

E. obliqua L'Herit.

Sometimes called Messmate.

E. Penrithensis Maiden.

Bastard Stringybark. Light to reddish-brown, concentric though not abundant gum-veins. Not a typical Stringybark—a reputed hybrid.

F. Coriaceæ—

- *E. de Beuzevillei* Maiden.
- *E. coriacea* A. Cunn.
- *E. Laseroni* R. T. Baker.
- *E. Mitchelliana* Cambage.
- *E. Risdoni* Hook. f.
- *E. stellulata* Sieb.
- *E. vitrea* R. T. Baker.

Mostly Gums, more brittle, and perhaps more liable to gum-veins than the generality of the section of Renantheræ to which they belong.

E. Laseroni is anomalous, for it is a reputed hybrid with a Stringybark, and its timber seems to bear out that assumption. It is sometimes known as "Stringybark," but it has more or less of a clean top. Indeed, several of the species have bark more or less rough at the butt.

The placing of *E. Risdoni* with the Coriaceæ rather than with the Peppermints (of which *E. amygdalina* is a representative) is a departure which will be emphasised in due course.

E. de Beuzevillei Maiden.

Pale-coloured, almost white, with kino veins. General resemblance to *E. coriacea* timber.

E. CORIACEA A. Cunn.

White Gum. Pale-coloured, liable to gum-veins, warps seriously.

E. LASERONI R. T. Baker. "Stringybark."

Yellowish-brown, tough to cut, brittle; pale, with gum-veins. A poor, upland timber.

E. MITCHELLIANA Cambage.

Drooping Gum. Pale coloured, with gum-veins.

E. RISDONI Hook. f.

Risdoni var. *elata* (Drooping Gum).

Pale coloured. This species appears to have a greater affinity with the Coriaceæ than with *amygdalina*, alongside which it has been usually placed.

E. STELLULATA Sieb.

Green or Lead Gum. Pale-coloured, rarely free from gum-veins, warps seriously.

Timber that shrinks much in drying may do so regularly or irregularly. Those of the first-class have, when dry, practically the same shape as the original piece, but those of the second-class take on irregular shapes. The timbers of *E. stellulata* and *E. coriacea* belong to the latter class.

E. VITREA R. T. Baker.

White-topped Messmate. Liable to gum-veins.

G. BRITTLE GUMS.

I name these timbers (enumerated below) collectively Brittle Gums, as their timbers are brittle rather than fissile. Colour pinkish (particularly when newly cut) to pale red. (They connect with both the Whites and the Reds).

Most of them are indeed Gums (18), with Half-barks (5), and Rough-barks (6).

(*a*) Gums (Leiophloiæ).

It will be observed that most of the timbers of this section are Gums. Most of them go under the name of White Gum, but some have different qualifying adjectives.

E. alba Reinw.
E. Benthami Maiden and Cambage.
E. cladocalyx F.v.M.
E. cordata Labill.
E. Dalrympleana Maiden.
E. Dunnii Maiden.
E. Gunnii Hook. f.
E. hæmastoma Sm.
E. Irbyi Baker and Smith.
E. leucoxylon F.v.M.
E. maculosa R. T. Baker.
E. Muelleri T. B. Moore.
E. Naudiniana F.v.M.
E. Perriniana F.v.M.
E. præcox Maiden.
E. rubida Deane and Maiden.
E. scoparia Maiden.
E. viminalis Labill.

(It will be observed that *E. hæmastoma* has been removed from the Renantheræ section as regards the timbers.)

E. alba Reinw.

White or Cabbage Gum. Red when newly cut, drying reddish-brown, coarse-fibred, not fissile, brittle, not durable.

E. Benthami Maiden and Cambage.

White Gum. Timber pale pink when fresh, and of moderate hardness and fissility.

E. cladocalyx F.v.M.

Sugar Gum. Pale, but slightly brown in the centre, tends to be brittle. White ants are fond of it.

E. cordata Labill.

A White Gum. Pale pink.

E. Dalrympleana Maiden.

White Gum. A pinkish timber, reputed to be of promise for paper-pulp.

E. Dunnii Maiden.

White Gum. White throughout, from the sap to the heart, somewhat coarse-grained and fissile, apparently tough.

E. Gunnii Hook. f.

Cider Gum. Pale-coloured, pink when fresh; brittle.

E. hæmastoma Sm.

White Gum. Reddish; soft, brittle and usually considered inferior.

E. Irbyi Baker and Smith.

White Gum. Pale-coloured.

E. leucoxylon F.v.M.

White Gum. Pale, inferior.

E. maculosa R. T. Baker.

White or Spotted Gum. Pink when fresh—dries paler; brittle, not durable.

E. Muelleri T. B. Moore.

Wood of a light red colour, extremely hard and surprisingly heavy, and of a stringy and close-grained character.

E. Naudiniana F.v.M.

Reddish when fresh.

E. Perriniana F.v.M.

A White Gum. Pale, brittle.

E. præcox Maiden.

White Gum. Pale-coloured, with kino veins; brittle.

E. rubida Deane and Maiden.

Candle-bark. Pink when fresh, dries paler. Brittle, not durable.

E. SCOPARIA Maiden.

White Gum. Pale-coloured.

E. VIMINALIS Labill.

Ribbony or White Gum. Pale pink when fresh.

(*b*) Half-barks (Hemiphloiæ).

I would emphasise the point that there is not a line of absolute demarcation between this section and the next (Rough-barks) so far as the timbers go.

The members go under the name of Woolly Butt (*Banksii* and *Macarthuri*), Peppermint (*cinerea*), while two (*ovata* and *Yarraensis*) are most commonly known as Swamp Gum, eloquent testimony to their affinity with the Gums.

E. Banksii Maiden.
E. cinerea F.v.M.
E. Macarthuri Deane and Maiden.
E. ovata Labill.
E. Yarraensis Maiden and Cambage.

E. BANKSII Maiden.

Woolly Butt. A good hard timber, pale-coloured, said to resemble that of *E. Stuartiana* somewhat.

E. CINEREA F.v.M.

Peppermint. Reddish, inferior, not durable.

E. MACARTHURI Deane and Maiden.

Woolly Butt. Pale-coloured, nearly white. Does not split well, not durable.

E. OVATA Labill.

Swamp Gum. Pale, not durable.

E. YARRAENSIS Maiden and Cambage.

Swamp Gum. Pale-coloured, resembling that of *E. ovata*.

(*c*) Rough-barks (Rhytophloiæ).

E. acaciæformis Deane and Maiden.
E. aggregata Deane and Maiden.
E. angophoroides R. T. Baker.
E. elæophora F.v.M.
E. nova-anglica Deane and Maiden.
E. Stuartiana F.v.M.

Most of these trees go under the name of Peppermint (*acaciæformis, aggregata, nova-anglica, Stuartiana*). Three are called Apple of one kind of another, viz., *angophoroides* (Apple-top Box), *elæophora* (Apple or Bastard Box), *Stuartiana* (Apple or Peppermint).

These names show a relation with the Peppermints enumerated at p. 142.

The Australian bushman uses the words Apple and Peppermint somewhat similarly. In the colder regions where the Apple-barked trees are found, he usually means that the Apple has a woollier bark than the Peppermint.

E. ACACIÆFORMIS Deane and Maiden.

Peppermint. Pale reddish.

E. AGGREGATA Deane and Maiden.

Black Gum. White, tough, not durable.

E. ANGOPHOROIDES R. T. Baker.

Apple-top Box. Pale-coloured, soft, specifically light timber, open in the grain and perhaps to be regarded as porous.

E. ELÆOPHORA F.v.M.

Bastard Box. Pale-coloured, not durable.

E. NOVA-ANGLICA Deane and Maiden.

Peppermint. Pinkish or pale red when fresh, drying to a pale colour. Not durable.

E. STUARTIANA F.v.M.

Apple Box. Pale (sometimes flesh-coloured when fresh), soft, brittle, not durable.

H. PALE, INLOCKED TIMBERS.

Economically this Group includes valuable timbers, indeed some of the best of the genus; there is not an inferior timber in the group.

E. canaliculata Maiden.
E. globulus Labill.
E. goniocalyx F.v.M.
E. hemiphloia F.v.M.
E. Maideni F.v.M.
E. melliodora A. Cunn.
E. microcorys F.v.M.
E. nitens Maiden.
E. notabilis Maiden.
E. Planchoniana F.v.M.
E. quadrangulata Deane and Maiden.
E. unialata R. T. Baker.

Of the above, the Gums (Leiophloiæ, 5) are *canaliculata*, *globulus*, *goniocalyx*, *Maideni*, *unialata*; the Half-barks (Hemiphloiæ, 4) are *hemiphloia*, *melliodora*, *nitens*, *quadrangulata*; the Rough-barks (Rhytiphloiæ, 3) are *microcorys*, *notabilis*, and *Planchoniana*.

E. CANALICULATA Maiden.

A Grey Gum. Pale-coloured, pale snuff-brown (Dauthenay Plate 2, shade 303). Somewhat coarse-fibred, tough, resembling that of *E. maculata* (Spotted Gum) and *E. microcorys* (Tallow-wood) a good deal.

E. GLOBULUS Labill.

Tasmanian Blue Gum. Timber pale.

E. GONIOCALYX F.v.M.

Mountain Gum. Pale-coloured, sometimes inclined to be fissile.

E. HEMIPHLOIA F.v.M.

Grey Box. Pale-coloured or light brown.

E. Maideni F.v.M.

A Blue Gum. Timber pale.

E. melliodora A. Cunn.

Yellow Box. Pale, almost yellowish, drying to a pale brown.

E. microcorys F.v.M.

Tallow-wood. Pale-coloured. Pale yellowish brown, tough, interlocked, of a greasy nature.

E. nitens Maiden.

Grey Box. Almost flesh-coloured when fresh, dries white. Straight in grain, but not very easy to work.

E. notabilis Maiden.

Pale-coloured (of the palest brown when freshly cut). Fair tensile strength.

E. Planchoniana F.v.M.

Bastard Tallow-wood. That it is sometimes substituted by Tallow-wood (*E. microcorys*) will give some idea of its properties.

E. quadrangulata Deane and Maiden.

Grey Box. Pale, tough.

E. unialata R. T. Baker.

Blue Gum. Pale-coloured, closely resembling *globulus*.

2. BROWN.

Most of these timbers are known as " Box " of one kind or another. The colour of the timber is brown, usually pale-brown, and of medium hardness and coarseness of fibre, but those of *E. ochrophloia* and *E. Thozetiana* are very hard and very dense, and also very brown. They are looked upon as durable, and generally valuable.

It is certainly sometimes not easy to make a sharp line of demarcation between some members of those in Group 1 (Pale Hardwoods) and some of the present group.

The trees producing the present group are divided between the Half-barks (Hemiphloiæ) and the Rough-barks (Rhytiphloiæ), two groups, it has already been explained, which run into each other. The vast preponderance of them belong to the Rough-barks.

E. Baueriana Schauer.
E. Blackburniana Maiden.
E. Bosistoana F.v.M.
E. Cloeziana F.v.M.
E. conica Deane and Maiden.
E. exserta F.v.M.
E. ochrophloia F.v.M.
E. odorata Behr.
E. Pilligaensis Maiden.
E. populifolia Hook.
E. rarifolia F. M. Bailey
E. Raveretiana F.v.M.
E. Thozetiana F.v.M.

E. BAUERIANA Schauer.

Blue Box. Timber brown, heartwood very hard, hence one of the local names, Lignum vitæ.

E. BLACKBURNIANA Maiden.

A Box. Pale brown. Interlocked.

E. BOSISTOANA F.v.M.

A Yellow Box. Its timber is often of a yellowish colour, a tint which it preserves for some time. Sometimes it is pinker, and hence obtains the name of Red Box. It is tough and inlocked.

E. CLOEZIANA F.v.M.

Pale-coloured, drying yellowish brown. Fissile, rather coarse and wavy in grain.

E. CONICA Deane and Maiden.

Fuzzy Box. Pale-brown, with a shade of pink.

E. EXSERTA F.v.M.

Brown, not red. Softish, easily split.

E. OCHROPHLOIA F.v.M.

Yapunyah. Brown, hard, heavy, close-grained.

E. ODORATA Behr.

South Australian Box or Peppermint. Pale coloured to brown, hard, interlocked.

E. PILLIGAENSIS Maiden.

Narrow-leaved Box. Brown, interlocked.

E. POPULIFOLIA Hook.

Bimble Box. Pale brown, wavy in grain, interlocked.

E. RARIFLORA Bailey.

A Box. Brown, very much like the preceding.

E. RAVERETIANA F.v.M.

A Box. Brown, very hard.

E. THOZETIANA F.v.M.

Brown, or blackish brown, not red. Tough.

Perhaps the following three timbers come in here, but I have not seen satisfactory specimens of them:—

E. Howittiana F.v.M.
E. Normantonensis Maiden and Cambage.
E. pruinosa Schau.

E. HOWITTIANA F.v.M.

"Wood, however, much like that of the former (*i.e.*, the Boxes), but its fibres not quite so interwoven, hence easier to split." (Inspector Stafford.)

E. Normantonensis Maiden and Cambage.

Box. Colour unknown.

E. pruinosa Schau.

Believed to be hard.

3. RED HARDWOODS.

All the timbers in this group are red, sometimes deep red, and, probably when over-mature, more or less brown. They are all durable. It is very difficult to subdivide them, but I have submitted a classification.

A. Red Gums—

E. amplifolia Naudin.
E. Bancrofti Maiden.
E. Blakelyi Maiden.
E. dealbata A. Cunn.
E. Parramattensis C. Hall.
E. rostrata Schlecht.
E. Seeana Maiden.
E. squamosa Deane and Maiden.
E. tereticornis Sm.

Most of these, viz., *amplifolia, Bancrofti, Blakelyi, dealbata, Parramattensis, rostrata, Seeana, tereticornis,* cluster round *E. rostrata,* the Murray Red Gum, as a type. They are deep red in colour, inclined to shell from presence of gum-veins when growing in uncongenial surroundings, but at their best, hard, interlocked, and durable.

E. amplifolia Naudin.

Red, interlocked; inferior.

E. Bancrofti Maiden.

Dark reddish brown, an inferior timber, so far as I have seen it.

E. Blakelyi Maiden.

Red, interlocked.

E. dealbata Maiden.

Timber red and tough, often faulty; the trees usually gnarled.

E. Parramattensis C. Hall.

Red of varying depth of tint, " soft, seasons badly "; " soft and ringy," " Centre wood red." This is either a disappearing species, or perhaps a form of *E. Seeana.*

E. rostrata Schlecht.

River Red Gum. Deep red, interlocked.

E. Seeana Maiden.

Deep red, tough, durable.

E. squamosa Deane and Maiden.

This seems to be a disappearing species; at all events, it is only known as a small, somewhat gnarled tree.

E. tereticornis Sm.

Forest Red Gum. Red, interlocked.

Following are three species not closely related to those Red Gums which have just been enumerated :—

E. cosmophylla F.v.M.

E. fasciculosa F.v.M.

E. pallidifolia F.v.M.

E. COSMOPHYLLA F.v.M.

A Red Gum. Red, easy working timber. Durable. Splits readily on the quarter, but backs badly with irregular fracture along the annual rings of growth. Confined to South Australia.

E. FASCICULOSA F.v.M.

Pink Gum. Deep reddish brown, not considered valuable. This is a second of a few species confined to South Australia.

E. PALLIDIFOLIA F.v.M.

A Red or White Gum. Red, hard, close-grained. This is a tropical species of whose timber we know but little.

B. BLUE GUM—

This is a term used in the old Australian sense, for the name Blue Gum originated, in the earliest days of settlement at Port Jackson, owing to the glaucous or bluish appearance of *Eucalyptus saligna.*

E. Deanei Maiden.

E. grandis (Hill) Maiden.

E. saligna Sm.

E. DEANEI Maiden.

Red or reddish brown.

E. GRANDIS (Hill) Maiden.

Strong, durable, will float in water when dry, which is an unusual circumstance in Eucalyptus timber.

E. SALIGNA Sm.

Red, fissile.

C. GREY GUM—

The original Grey Gum is *E. punctata*, and *E. propinqua* is closely related to it. The origin of the name Grey Gum was described at Part LI, p. 32.

E. adjuncta Maiden.

E. propinqua Deane and Maiden.

E. punctata DC.

E. ADJUNCTA Maiden.

Timber deep red.

E. propinqua Deane and Maiden.

Red. The timber so resembles that of Red Ironbark as to be often substituted for it.

E. punctata DC.

Hardly to be distinguished from the preceding.

D. Red Box—

The term " Red Box " was first given to *E. polyanthemos*, to indicate a tree with " box " bark (a term of rather wide application, as has already been seen, under Barks, Part LI, p. 36),and with red interlocked timber. Every tree is known as Box of some kind or another. Most of them come from New South Wales, but three are peculiar to tropical Queensland. There is sometimes a very undefined line between a Box and a Gum, while the name Blackbutt is often applied locally (see Part L, p. 310) to a Gum with not very much dark, flaky bark at the butt.

E. bicolor A. Cunn.
E. Brownii Maiden and Cambage.
E. Cambageana Maiden.
E. Dawsoni R. T. Baker.
E. intertexta R. T. Baker.
E. leptophleba F.v.M.
E. microtheca F.v.M.
E. polyanthemos Schauer.
E. Rudderi Maiden.

E. bicolor A. Cunn.

Box of one kind or another. Timber red, or rarely reddish-brown. Interlocked.

E. Brownii Maiden and Cambage.

Box. Dark red.

E. Cambageana Maiden.

Blackbutt or Gum. Deep red or chocolate; used for milling.

E. Dawsoni R. T. Baker.

Deep red, interlocked.

E. intertexta R. T. Baker.

Red, interlocked.

E. leptophleba F.v.M.

Box or Blackbutt. Red, hard, durable.

E. microtheca F.v.M.

Coolabah or Flooded Box. See Part LI, p. 39.

E. polyanthemos Schauer.

The original Red Box. Deep red, interlocked.

E. Rudderi Maiden.

Red. (A dubious brown specimen noted at Part XIII, p. 118.)

E. MAHOGANY—

This name is a very old one as applied to Australian hardwoods, and was first applied to *E. resinifera*, the Red or Forest Mahogany. It reminded the first settlers of the West Indian Mahogany, to which is is not botanically closely related.

E. Kirtoniana F.v.M.
E. pellita F.v.M.
E. resinifera Sm.

E. KIRTONIANA F.v.M.

Red.

E. PELLITA F.v.M.

A Mahogany. Red.

E. RESINIFERA Sm.

Red or Forest Mahogany. Red, durable.

F. WOOLLY-BUTT—

The term Woolly-butt is self-explanatory, being applied to trees whose butts are more or less covered with a soft bark. All vernaculars tend to laxity of application, and this particular name has been applied to trees which have harsh rather than soft barks.

E. botryoides and *E. robusta* are often known as Mahogany, but their barks are softer than those of *E. resinifera* and its allies.

E. botryoides Sm.
E. longifolia Link and Otto.
E. robusta. Sm.

E. BOTRYOIDES Sm.

Bastard Mahogany. Deep red.

E. LONGIFOLIA Link and Otto.

Woolly-butt or Peppermint. Red.

E. ROBUSTA Sm.

Swamp Mahogany. Deep red.

4. IRONBARKS (Schizophloiæ).

Ironbark timbers form (as a group) the heaviest, toughest, and strongest of Eucalyptus timbers. The prevailing colour is red, but in *E. Beyeri* we have brown as the prevailing colour, and *E. paniculata* (usually looked upon as the most valuable of all Ironbark timbers) has the palest-coloured of all the Ironbarks, with, however, shades of red.

E. Beyeri R. T. Baker.
E. Caleyi Maiden.
E. crebra F.v.M.
E. Culleni R. H. Cambage.
E. decorticans (Bailey) Maiden.
E. drepanophylla F.v.M.
E. melanophloia F.v.M.
E. paniculata Sm.
E. siderophloia Benth.
E. sideroxylon A. Cunn.
E. Staigeriana F.v.M.

E. BEYERI R. T. Baker.

Beyer's Ironbark. "Dark chocolate." It is the brownest of the Ironbark timbers, which are, however, all more or less brownish.

E. CALEYI Maiden.

Caley's Ironbark. Deep red, durable.

E. CREBRA F.v.M.

Narrow-leaved Red Ironbark. Red, hard, durable.

E. CULLENI R. H. Cambage.

Cullen's Ironbark. Red.

E. DECORTICANS (Bailey) Maiden.

Deciduous barked Ironbark. Red.

E. DREPANOPHYLLA F.v.M.

Red. Imperfectly known.

E. MELANOPHLOIA F.v.M.

Silver-leaved Ironbark. Red; inferior.

E. PANICULATA Sm.

Grey or White Ironbark. In colour it varies from grey to shades of a yellowish colour, or light red and very brown dark, but these colours change in drying, sometimes becoming, where dark, much paler, and in the case of pale red and grey, becoming of darker colour.

E. SIDEROPHLOIA Benth.

Broad-leaved Red Ironbark. Red.

E. SIDEROXYLON A. Cunn.

Fat-cake Ironbark. Mugga. Dark red.

E. STAIGERIANA F.v.M.

Lemon-scented Ironbark. Red.

A. IRONBARK-BOXES—

Hard pale-coloured, tough, timbers. The trees are assumed to be natural hybrids between the Ironbarks and the Boxes, and the timbers have characters which seem to be intermediate between those of the reputed parents. Some of the Ironbarks and Boxes are deemed to be especially susceptible to hybridisation. The subject is dealt with at some length at p. 109 of the present Part.

E. affinis Deane and Maiden.
E. Boormani Deane and Maiden.
E. hybrida Maiden.

E. AFFINIS Deane and Maiden.

Medium brown, hard, heavy, tough.

E. Boormani Deane and Maiden.

Pale reddish brown. Hard, tough, very durable.

E. hybrida Maiden.

Pale-coloured, hard, interlocked.

5. BLOODWOODS.

They are liable to shell and to contain much kino. Geologically they are reputed to be the oldest of the Eucalypts, and hence to include some of the least vigorous species and, therefore, timbers.

A. Red Bloodwoods—

E. Abergiana F.v.M.
E. Cliftoniana W. V. Fitzgerald.
E. corymbosa Sm.
E. dichromophloia F.v.M.
E. Foelscheana F.v.M.
E. grandifolia R.Br.
E. hæmatoxylon Maiden.
E. Hillii Maiden.
E. latifolia F.v.M.
E. miniata A. Cunn.
E. perfoliata R.Br.
E. phœnicea F.v.M.
E. ptychocarpa F.v.M.
E. pyrophora Benth.
E. terminalis F.v.M.

Some of the timbers in this section are described as reddish-brown. They are, however, deep coloured and more or less red. It may be that we have a group of intermediates, reddish-brown; on the other hand, I have seen so few timbers of this class, that I am inclined to think that they are a faded or oxidised form of the definitely red timbers, and, until further evidence is available, I think they should be looked upon as Red Bloodwoods. At the same time, I have followed my usual practice of not altering original notes as to colour, &c.

The red timbers are especially durable. It is very interesting to find that the timber of *E. hæmatoxylon* is red, while the colour of that of *E. calophylla* and *E. ficifolia*, the only other sub-tropical Western Australian species, is pale.

E. Abergiana F.v.M.

"Reddish." I have not seen a specimen.

E. Cliftoniana W. V. Fitzgerald.

"Red, tough and hard."

E. corymbosa Sm.

Deep red.

E. dichromophloia F.v.M.

Reddish brown.

E. Foelscheana F.v.M.

Red, apparently not a large tree.

E. grandifolia R.Br.

Reddish brown.

E. hæmatoxylon Maiden.

Red, with gum-veins. "Very soft." Our specimen is red, like *E. corymbosa,* and thus sharply different from *E. ficifolia* and *E. calophylla.*

E. Hillii Maiden.

Rich reddish brown. Hard.

E. latifolia F.v.M.

Pale red. (I have reason to believe that this refers to the timber of a small tree which is paler than that of a mature one.)

E. miniata A. Cunn.

Red, hard, but "reddish brown," according to Mr. Cambage.

E. perfoliata R. Brown.

Dark red, tough and hard.

E. phœnicea F.v.M.

Reddish brown.

E. ptychocarpa F.v.M.

Red, soft and very porous.

E. pyrophora Benth.

The colour of the variety *polycarpa* is red. I have not seen timber of the normal species.

E. terminalis F.v.M.

Deep red.

B. Pale Bloodwoods—

E. calophylla R.Br.
E. eximia Schauer.
E. ficifolia F.v.M.
E. intermedia R. T. Baker.
E. maculata Hook.
E. peltata Benth.
E. trachyphloia F.v.M.
E. Watsoniana F.v.M.

These correspond, in the main, to the Pale Bloodwood barks enumerated at p. 56, Part LI. While *E. calophylla* and *E. ficifolia* have pale timbers, their barks are not so pale as most of those of the Pale Bloodwoods.

E. maculata (Spotted Gum) is an extreme form, with pale bark, it is true, but with the smoothness of a Gum, while the timber is paler than all the others of this section.

E. calophylla R.Br.

Red Gum. Pale-coloured, with numerous gum-veins.

E. eximia Schauer.

Yellow Bloodwood.

E. ficifolia F.v.M.

Resembles *E. calophylla* a good deal, but a smaller tree.

E. INTERMEDIA R. T. Baker.

White Bloodwood. Pale coloured. "Hard, straight-grained." Sometimes pinkish, but paler than *E. corymbosa*, and somewhat variable.

E. MACULATA Hook.

Spotted Gum. Tough, interlocked, durable.

E. PELTATA Benth.

Yellow Jacket. Pale towards the outside, dark brown near the centre.

E. TRACHYPHLOIA F.v.M.

White Bloodwood. Brown, brittle of some writers. Pale coloured, somewhat like *E. maculata*.

E. WATSONIANA F.v.M.

Pale brown.

(*a*) *E. setosa* Group.

This Group has the Bloodwood-like fruits, combined with scabrous Angophora-like foliage, and thus we have a connecting link between the Bloodwoods and the Moreton Bay Ashes. The only important member, *E. Torelliana*, has timber which resembles that of *E. maculata*, the Spotted Gum.

E. aspera F.v.M.
E. ferruginea Schau.
E. setosa Schau.
E. Torelliana F.v.M.

E. ASPERA F.v.M.

A small tree; I know little of its timber.

E. FERRUGINEA Schau.

This is closely allied to *E. setosa*, and is apparently small. I have not been able to obtain a specimen of the timber.

E. SETOSA Schau.

Reddish, moderately hard and tough, according to one writer. Dark brown (R. H. Cambage), hard, strong, and durable.

E. TORELLIANA F.v.M.

Very pale, whitish to pale brown. Reminiscent of *E. maculata*, only freer. Very fissile. An important timber.

(*b*) Moreton Bay Ash Group.

This is a naturally defined Group, with thin, papery fruits, which are very deciduous. The bushman is quite aware of the peculiar nature of these fruits, which remind one of those of the common Apple-trees (*Angophora*).

The colours of the timbers vary from dark brown to brownish-red and red. It must be borne in mind that we know but little of most of these timbers, except

E. tessellaris, and it will probably prove to be a fact that the prevailing colour is dark brown, and that they present a good deal of similarity to that timber.

E. brachyandra F.v.M.	*E. Spenceriana* Maiden.
E. clavigera A. Cunn.	*E. tessellaris* F.v.M.
E. papuana F.v.M.	

E. BRACHYANDRA F.v.M.

Red, hard, and tough.

E. CLAVIGERA A. Cunn.

Brownish red, and fairly hard and tough, according to Mr. Froggatt. Described by others as "dark brown" and "rich deep brown." Close in the grain and durable. White-ants will not touch it in the Northern Territory.

E. PAPUANA F.v.M.

Very dark brown.

E. SPENCERIANA Maiden.

Dark reddish brown. Interlocked, "excellent, durable."

E. TESSELLARIS F.v.M.

Dark brown, heavy, interlocked in fibre.

(*c*) Eudesmieæ.

The relations of this very small group of trees is purely botanical, and remain of scientific interest at present. Some members of the Group are imperfectly known (*e.g.*, *eudesmioides*) and may prove to attain a size and an abundance in certain districts which will render them of economic importance.

E. Baileyana F.v.M.
E. lirata (W. V. Fitzgerald) Maiden.
E. tetrodonta F.v.M.

E. BAILEYANA F.v.M.

Light grey when fresh, very tough, inferior in quality.

E. LIRATA (W. V. Fitzgerald) Maiden.

Brownish, fairly hard and rather free in the grain.

E. TETRODONTA F.v.M.

Messmate or Stringybark. Reddish brown and hard. Of considerable importance locally.

6. WESTERN AUSTRALIAN HARDWOODS.

I offer this as an empirical classification—

1. Because they are largely endemic to the Western State, and
2. For geographical reasons it will be convenient, from all points of view, to keep most of the Western Australian timbers separate.

A. PALE BROWN—

- *E. cornuta* Labill.
- *E. decipiens* Endl.
- *E. fœcunda* Schau.
- *E. gomphocephala* DC.
- *E. Guilfoylei* Maiden.
- *E. megacarpa* F.v.M.
- *E. Mundijongensis* Maiden.
- *E. occidentalis* Endl.
- *E. patens* Benth.
- *E. redunca* Schau.
- *E. rudis* Endl.
- *E. salubris* F.v.M.
- *E. Todtiana* F.v.M.

Practically all these timbers come from the comparatively well-watered south-west. They vary a good deal in colour from the palest to a moderately dark brown, and in quality from exceptionally hard, tough, and durable, such as *E. cornuta* (Yate) and *E. occidentalis* (Flat-topped or Swamp Yate), to such inferior timbers as *decipiens*, *megacarpa* and *rudis*, with a number of useful intermediate ones.

E. CORNUTA Labill.

Yate. Pale brown; toughest of Western Australian woods, and said to be the strongest in Australia.

E. DECIPIENS Endl.

Dull pale brown, liable to gum-veins, cracks radially, is brittle and perishable, and of no ascertained economic value.

E. FŒCUNDA Schau.

York Gum. Timber dark brown, hard.

E. GOMPHOCEPHALA DC.

Tuart. Pale-coloured and of a yellowish cast. Reminds one of *cladocalyx* and *leucoxylon*, but is superior in quality to both.

E. GUILFOYLEI Maiden.

Yellow Tingle Tingle. Pale-coloured, fissile.

E. MEGACARPA F.v.M.

Brownish towards heart, liable to gum-veins; not durable, apparently a disappearing species.

E. MUNDIJONGENSIS Maiden.

A Tuart. Pale-coloured, reminiscent of *E. gomphocephala*, but not seen by me.

E. OCCIDENTALIS Endl.

Flat-topped Yate. Brown, tough.

E. PATENS Benth.

Blackbutt of the south-west. Pale brown.

E. REDUNCA Schau.

Wandoo or White Gum. *E. redunca* var. *elata*. Pale brown, drying dark brown, hard, particularly tough, interlocked, heavy and durable,

E. RUDIS Endl.

Swamp Gum. Yellowish to pale brown when fresh, to brown later, brittle and readily attacked by insects.

E. SALUBRIS F.v.M.

Gimlet. Pale brown.

E. TODTIANA F.v.M.

A Blackbutt. Pale brown, brittle, not durable.

B. DULL CIGAR-BROWN—

- *E. celastroides* Turcz.
- *E. Clelandi* Maiden.
- *E. corrugata* Luehmann.
- *E. gracilis* F.v.M.
- *E. Griffithsii* Maiden.
- *E. Le Souefi* Maiden.
- *E. Stricklandi* Maiden.

These are Gold-fields (Kalgoorlie district) timbers, and I followed the wood-choppers on the wood-lines for some days. I formed the opinion that most of the timbers were of that bright brown colour known as cigar-brown. It may be, however, that this colour represents a stage of oxidation or over-ripeness.

E. CELASTROIDES Turcz.

Cigar-brown, " very hard, dense, splitting very straight"; a spear wood.

E. CLELANDI Maiden.

Cigar-brown.

E. CORRUGATA Luehmann.

Cigar-brown.

E. GRACILIS F.v.M.

Deep cigar-brown, tough. (I am referring to the Western Australian form of this tree).

E. GRIFFITHSII Maiden.

Reddish brown.

E. LE SOUEFI Maiden.

Cigar-brown.

E. STRICKLANDI Maiden.

A Blackbutt. Colour of timber, rich deep brown.

C. RED TIMBERS—

- *E. accedens* W. V. Fitzgerald.
- *E. argillacea* W. V. Fitzgerald.
- *E. confluens* W. V. Fitzgerald.
- *E. diversicolor* F.v.M.
- *E. Drummondii* Bentham.
- *E. Flocktoniæ* Maiden.
- *E. Houseana* W. V. Fitzgerald.
- *E. Jacksoni* Maiden.
- *E. Lane-Poolei* Maiden.
- *E. longicornis* F.v.M.
- *E. marginata* Sm.
- *E. Mooreana* (W.V.F.) Maiden.
- *E. salmonophloia* F.v.M.
- *E. transcontinentalis* Maiden.

Here, again, the colour varies from red to reddish-brown, and we require more information as to colours. The majority of these trees come from coastal localities, but some are from the drier country.

E. accedens W. V. Fitzgerald.

Powder-bark. Pale reddish when fresh, darkening somewhat with age. Hard, interlocked.

E. argillacea W. V. Fitzgerald.

Reddish to brownish, very hard and tough. (From the tropics.)

E. confluens W. V. Fitzgerald.

Brownish red to red, very hard and extremely tough. (A tropical species.)

E. diversicolor F.v.M.

Karri. Red. Resembles *E. marginata*, but not durable underground. (A south-western species.)

E. Drummondii Bentham.

Red, but apparently only a small tree.

E. Flocktoniæ Maiden.

The timber-cutters see no difference between this timber and *E. transcontinentalis* (see below, this page).

E. Houseana W. V. Fitzgerald.

Reddish, not very hard or tough. (A tropical species.)

E. Jacksoni Maiden.

Red Tingle Tingle. Timber bright red, reminding one, in this respect, of *E. resinifera*. It is fissile and tough. (A south-western species.)

E. Lane-Poolei Maiden.

A White Gum. Rich reddish brown, drying, in course of years, to deep purplish brown; interlocked. (A south-western species.)

E. longicornis F.v.M.

Morrel. Red, very tough.

E. marginata Sm.

Jarrah. Deep red, durable; Perth and south-western districts; the best known of the Western timbers.

E. Mooreana (W.V.F.) Maiden.

Reddish, tough and moderately hard. (A tropical species.)

E. salmonophloia F.v.M.

Salmon Gum. Reddish brown, red with crimson in it when fresh; very durable. The largest tree on the Gold-fields, and often associated with Gimlet (*E. salubris*).

E. transcontinentalis Maiden.

Rich reddish brown, very tough.

Explanation of Plates (216-219.)

PLATE 216.

E. Barmedmanensis Maiden, n.sp.

1a. Twig with mature leaves and buds; *1b*, leaf, somewhat enlarged, to show venation; 1c, immature fruits, showing rims; *1d*, mature fruits. "White Ironbark" or "Ironbark Box," Barmedman, New South Wales, 16th September, 1900 (R. H. Cambage). The type.

2a. Twig with mature leaves and buds; *2b*, fruits. "Ironbark" or "Bastard Ironbark," Trowell Creek, Nymagee, New South Wales, May, 1900 (R. H. Cambage). This differs from the type in longer peduncles and pedicels, and in more attenuated opercula.

E. melliodora A. Cunn. var.

3a. Intermediate leaf; *3b*, mature leaf; *3c*, buds; *3d*, anther; *3e*, immature fruit; *3f*, mature fruits. Murrurundi, New South Wales, May, 1902 (J.H.M. and J. L. Boorman). A form of the species referred to at p. 111.

PLATE 217.

E. Tenandrensis Maiden, n.sp.

1a, *1b*, *1c*. Intermediate leaves in various stages; *1d*, mature leaf and fruits. February, 1921.

2a. Juvenile leaf, or the youngest leaf I have seen; *2b*, immature buds. April, 1921.

The whole from an Ironbark tree in Tenandra State Forest, No. 166, Parish Baronne, county Leichhardt, New South Wales (Forest Guard Withers). The type.

E. Peacockeana Maiden, n.sp.

3a. Juvenile leaves; *3b*, mature leaf with buds; *3c*, two types of anthers produced by this hybrid; *3d*, fruits. Elsmore Station, parish Elsmore, Inverell district, county Gough, New South Wales, November, 1920 (Lance Beresford Peacocke). The type.

PLATE 218.

E. Stopfordi Maiden, n.sp.

1a. Intermediate leaf (in as early a stage as I have seen); *1b*, twig with mature leaves and buds (double opercula are common); 1c, three views of anthers. Near Inverell, New South Wales, May, 1910, (the late A. E. Stopford, District Forester.) The type.

E. Forsythii Maiden, n.sp.

2a. Twig with flowers; *2b*, anther; *2c*, twig with fruits. Coonabarabran-Baradine road, October, 1899 (the late William Forsyth). The type.

PLATE 219.

E. Auburnensis Maiden, n.sp.

1a. Juvenile leaf; *1b*, juvenile leaf, a stage further, in the acuminate stage; 1c, mature leaf; *1d*, fruits. Auburn Vale, near Inverell, New South Wales, 1907 (District Forester Gordon Burrow). The type.

E. Yagobiei Maiden, n.sp. (erroneously spelled on the Plate).

2a. Juvenile leaf; *2b*, *2c*, *2d*, various stages of intermediate leaf; *2e*, mature leaf; *2f*, bud; *2g*, two views of anther; *2h*, panicle of fruits; *2i*, top view of fruit. Parish of Yagobie, on banks of Gwydyr River, county of Burnett, New South Wales, 1916 (District Forester Gordon Burrow). The type.

E. Studleyensis Maiden, n.sp.

3a. Juvenile leaf; *3b*, intermediate leaf; *3c*, twig with mature leaf and buds; *3d*, front and back view of anther; *3e*, fruits. Studley Park, Kew, Melbourne, Victoria (Alfred Douglas Hardy). The type.

The following species of Eucalyptus are illustrated in my "Forest Flora of New South Wales"* with larger twigs than is possible in the present work; photographs of the trees are also introduced wherever possible. Details in regard to their economic value, &c., are given at length in that work, which is a popular one. The number of the Part of the Forest Flora is given in brackets:—

acacioides A. Cunn. (xlviii).
acmenioides Schauer (xxxii).
affinis Deane and Maiden (lvi).
amygdalina Labill. (xvi).
Andrewsi Maiden (xxi).
Baileyana F.v.M. (xxxv).
Baueriana Schauer (lvii).
Baueriana Schauer var. *conica* Maiden (lviii).
Behriana F.v.M. (xlvi).
bicolor A. Cunn. (xliv).
Boormani Deane and Maiden (xlv).
Bosistoana F.v.M. (xliii).
Caleyi Maiden (lv).
capitellata Sm. (xxviii).
conica Deane and Maiden (lviii).
Consideniana Maiden (xxxvi).
coriacea A. Cunn. (xv).
corymbosa Sm. (xii).
crebra F.v.M. (liii).
Dalrympleana Maiden (lxiv).
dives Schauer (xix).
dumosa A. Cunn. (lxv).
eugenioides Sieber. (xxix).
fruticetorum F.v.M. (xlii).
gigantea Hook. f. (li).
globulus Labill. (lxvii).
goniocalyx F.v.M. (vi).
hæmastoma Sm. (xxxvii).
hemiphloia F.v.M. (vi).
longifolia Link and Otto (ii).
Luehmanniana F.v.M. (xxvi).
macrorrhyncha F.v.M. (xxvii).
maculata Hook. (vii).
Maideni F.v.M. (lxix).
melanophloia F.v.M. (liv).
melliodora A. Cunn. (ix).
microcorys F.v.M. (xxxviii).
microtheca F.v.M. (lii).
Muelleriana Howitt (xxx).
numerosa Maiden (xvii).
obliqua L'Hérit. (xxii).
ochrophloia F.v.M. (l).
odorata Behr and Schlectendal (xli).
oleosa F.v.M. (lx).
paniculata Sm. (viii).
pilularis Sm. (xxxi).
piperita Sm. (xxxiii).
Planchoniana F.v.M. (xxiv).
polyanthemos Schauer (lix).
populifolia Hook. (xlvii).
propinqua Deane and Maiden (lxi).
punctata DC. (x).
radiata Sieb., as *amygdalina* (xvi).
regnans F.v.M. (xviii).
resinifera Sm. (iii).
robusta Sm. (lxviii).
rostrata Schlecht. (lxii).
rubida Deane and Maiden (xliii).
saligna Sm. (iv).
siderophloia Benth. (xxxix).
sideroxylon A. Cunn. (xiii).
Sieberiana F.v.M. (xxxiv).
stellulata Sieb. (xiv).
tereticornis Sm. (xi).
tessellaris F.v.M. (lxvi).
Thozetiana F.v.M. (xlix).
viminalis Labill. (lxiv).
virgata Sieb. (xxv).
vitrea R. T. Baker (xxiii).

---

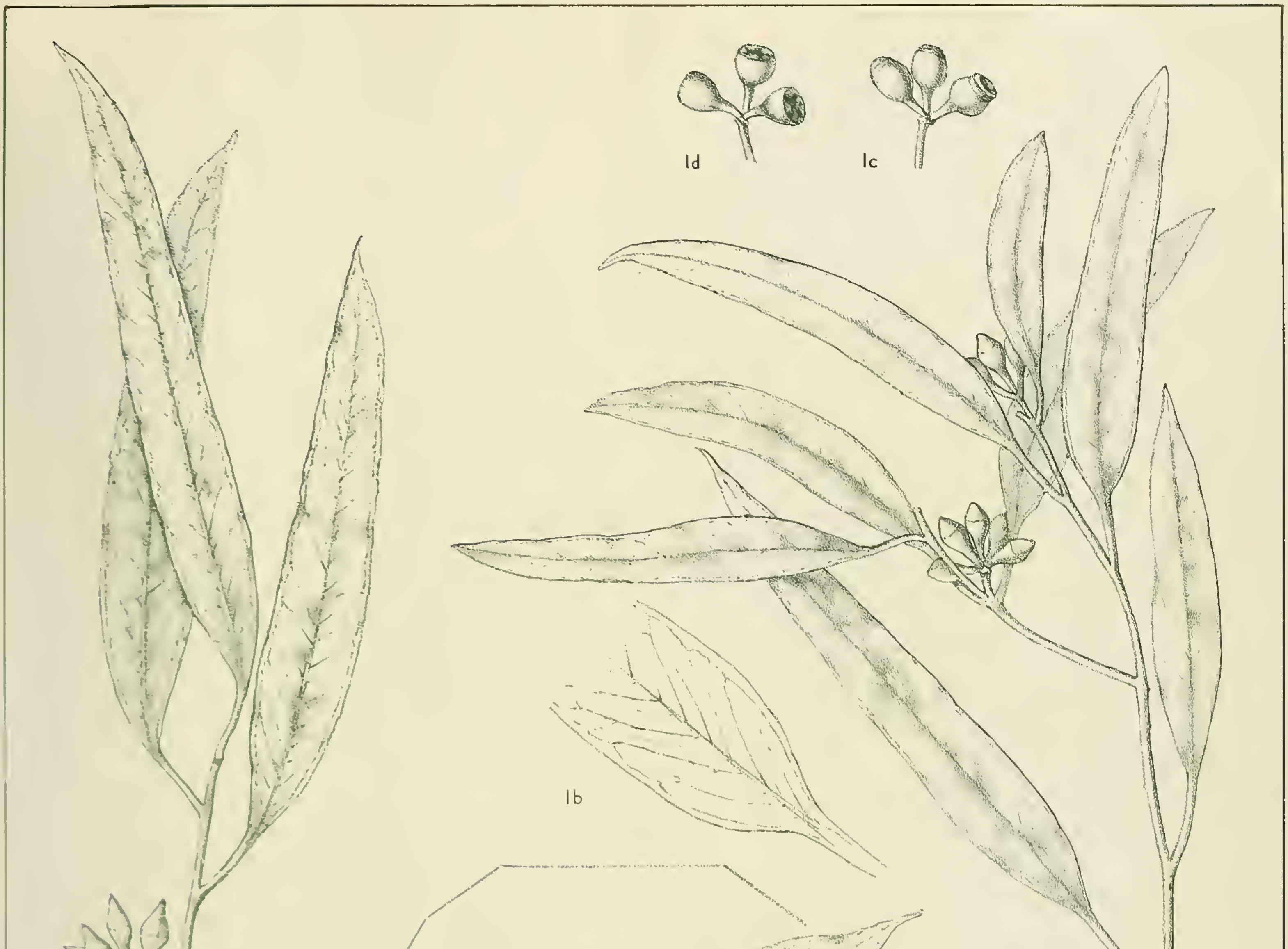
* Government Printer, Sydney. 4to. Each part contains 4 plates and other illustrations.

NOTE BY GOVERNMENT PRINTER.

War conditions have so largely affected publications that it is no longer possible to continue the issue of "The Forest Flora of New South Wales" at the old rates, and from this date onward, *i.e.*, from and including Part 7, Vol. VII, the price of the individual Parts will be raised to 2s. 6d. each.

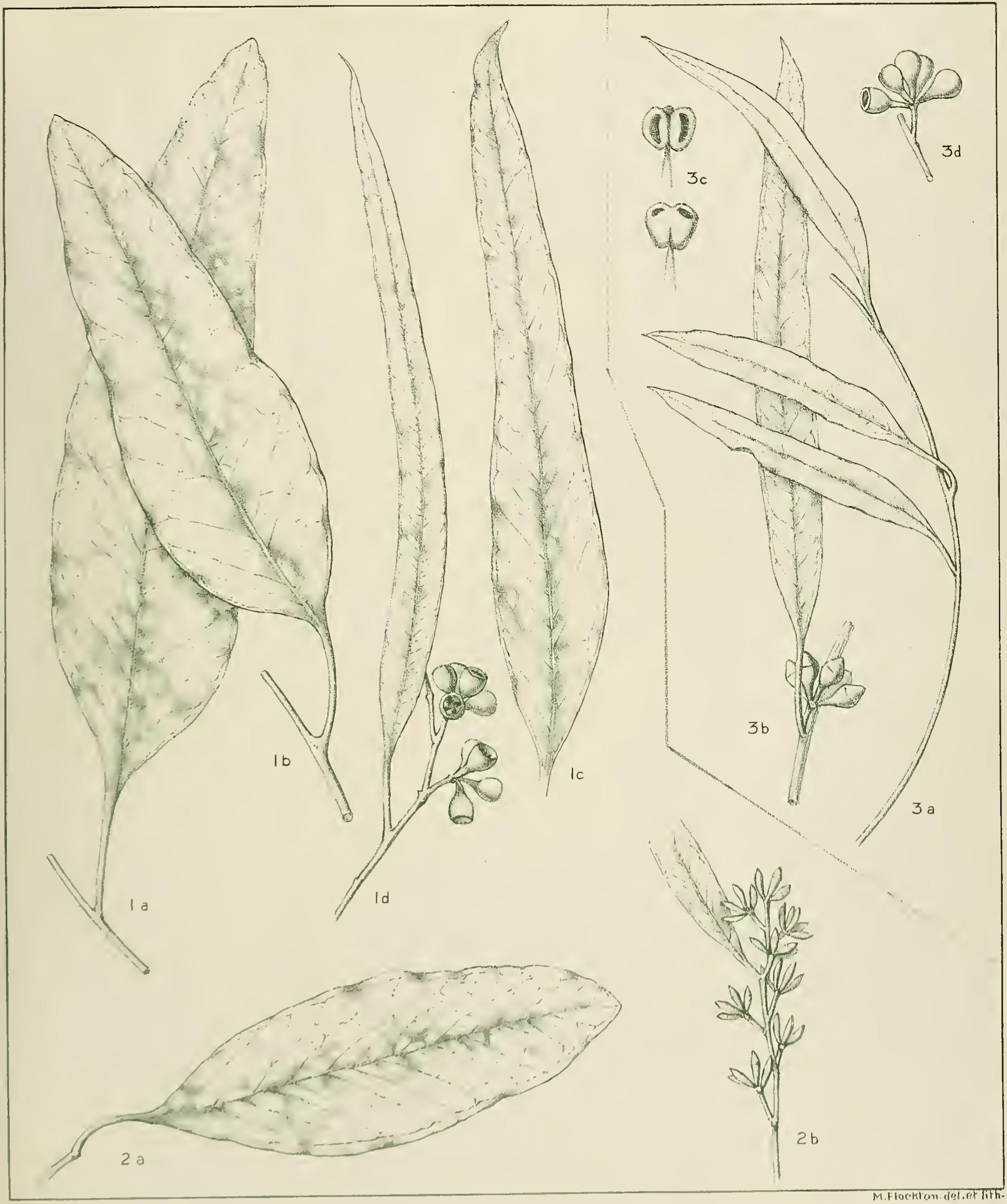
For those Parts already published the old sale price will be adhered to, and subscriptions already received will not be disturbed, but the new subscription rate of 2s. 6d. per part, or 25s. for 12 parts, will come into effect as from the 1st July, 1921.

Sydney: William Applegate Gullick, Government Printer 1922



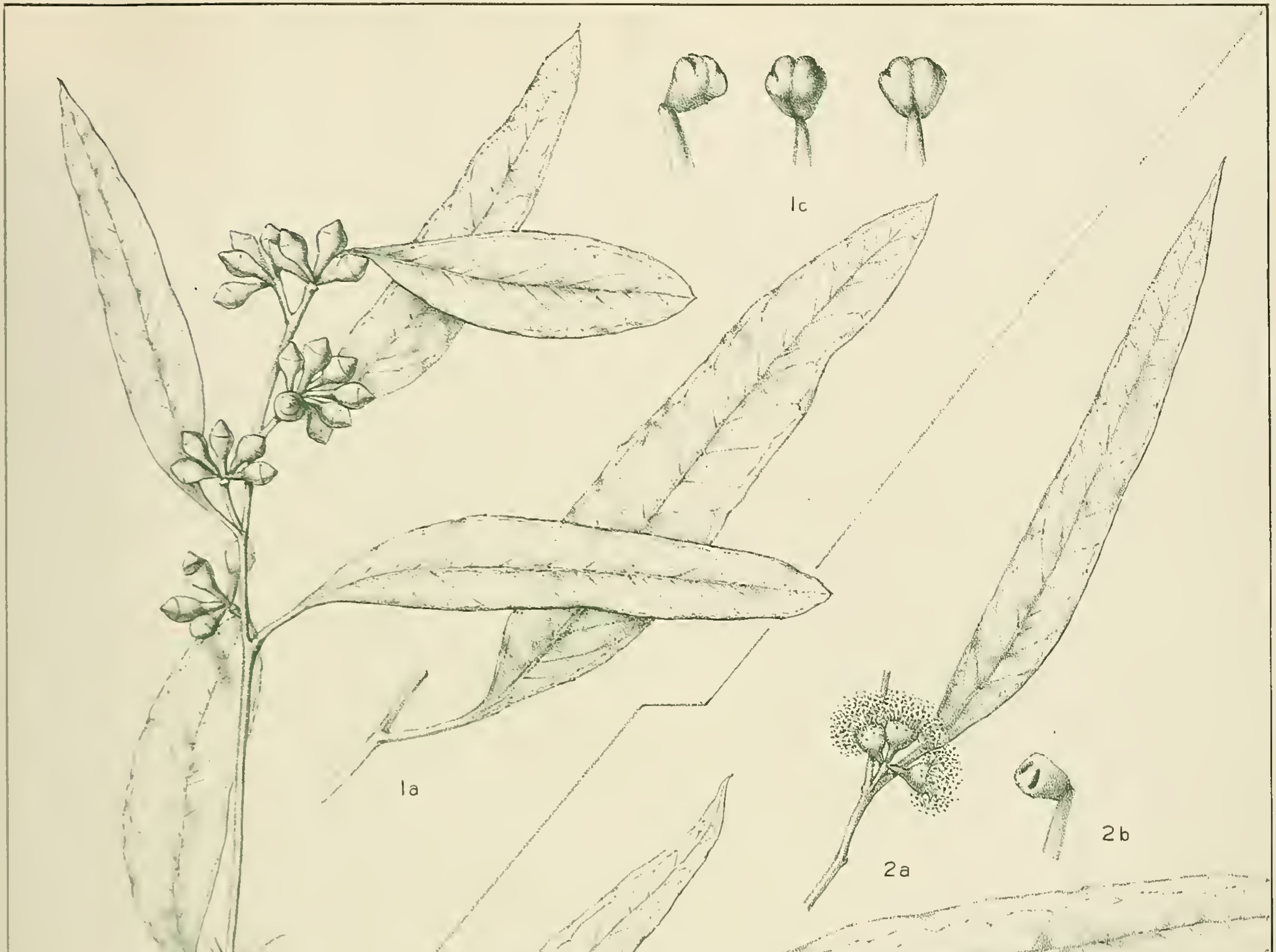
×EUCALYPTUS BARMEDMANENSIS MAIDEN, n.sp. (*1*, *2*).

E. MELLIODORA A. CUNN.; *var.* (*3*). [See Plate 61.]



× EUCALYPTUS TENANDRENSIS Maiden, n.sp. (*1, 2*).

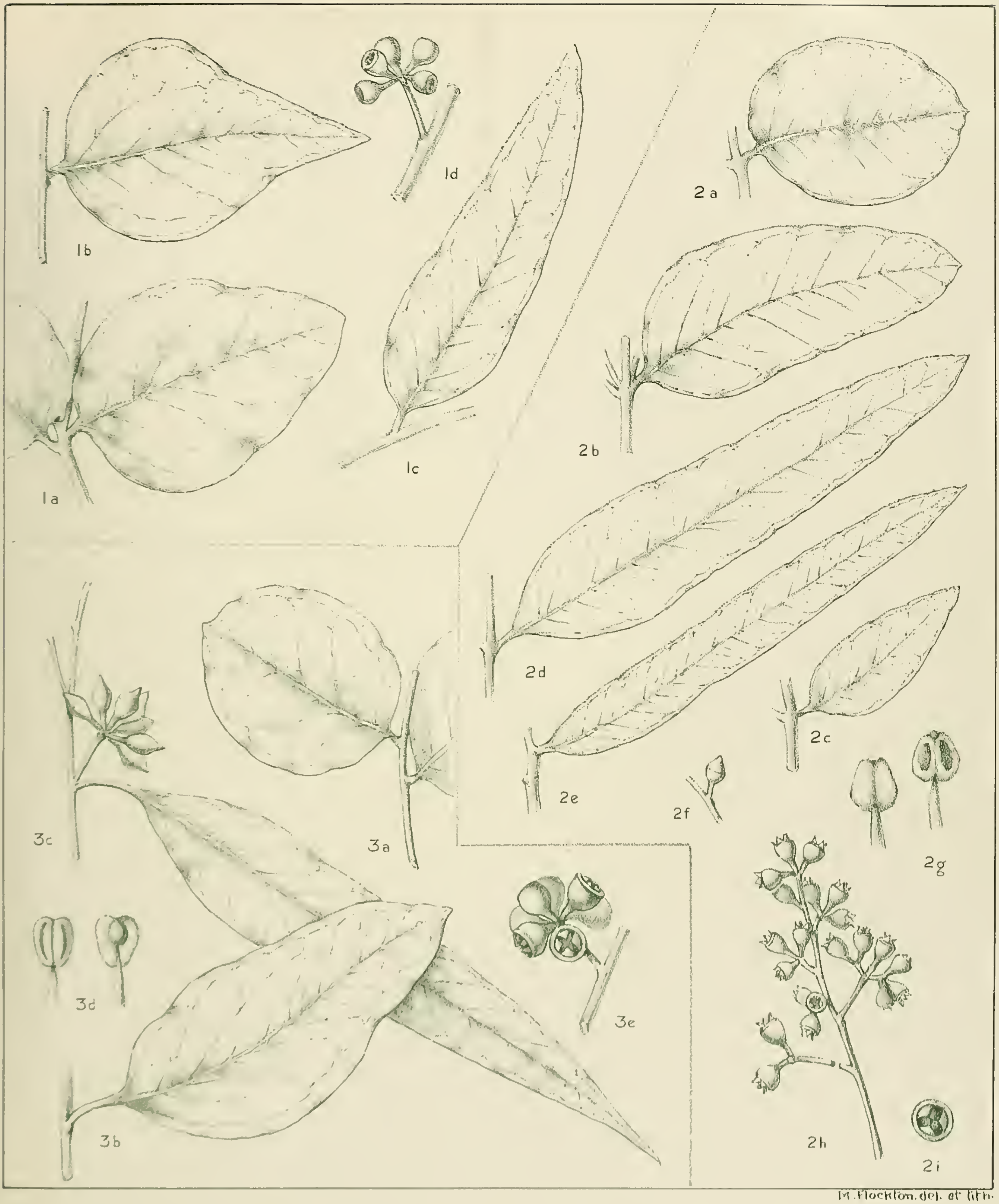
× E. PEACOCKEANA Maiden, n.sp. (*3*).



M. Flockton del. et lith.

× EUCALYPTUS STOPFORDI MAIDEN, n.sp (*1*).

× E. FORSYTHII MAIDEN, n.sp. (*2*).



M. Flockton, del. et lith.

× EUCALYPTUS AUBURNENSIS Maiden, n.sp. (*1*).
× E. YAGOBEI Maiden, n.sp. (*2*).
× E. STUDLEYENSIS Maiden, n.sp. (*3*).

INDEX OF PARTS PUBLISHED—*continued.*

PART XXI.

113. *E. cinerea* F.v.M.
114. *E. pulverulenta* Sims.
115. *E. cosmophylla* F.v.M.
116. *E. gomphocephala* A. P. DC.
Plates, 89-92. (Issued March, 1914.)

PART XXII.

117. *E. erythronema* Turcz.
118. *E. acaciæformis* Deane & Maiden.
119. *E. pallidifolia* F.v.M.
120. *E. cæsia* Benth.
121. *E. tetraptera* Turcz.
122. *E. Forrestiana* Diels.
123. *E. miniata* A. Cunn.
124. *E. phœnicia* F.v.M.
Plates, 93-96. (Issued April, 1915.)

PART XXIII.

125. *E. robusta* Smith.
126. *E. botryoides* Smith.
127. *E. saligna* Smith.
Plates, 97-100. (Issued July, 1915.)

PART XXIV.

128. *E. Deanei* Maiden.
129. *E. Dunnii* Maiden.
130. *E. Stuartiana* F.v.M.
131. *E. Banksii* Maiden.
132. *E. quadrangulata* Deane and Maiden.
Plates, 100 bis-103. (Issued November, 1915.)

PART XXV.

133. *E. Macarthuri* Deane and Maiden.
134. *E. aggregata* Deane and Maiden.
135. *E. parvifolia* Cambage.
136. *E. alba* Reinwardt.
Plates, 104-107. (Issued February, 1916.)

PART XXVI.

138. *E. Perriniana* F.v.M.
139. *E. Gunnii* Hook f.
140. *E. rubida* Deane and Maiden.
Plates, 108-111. (Issued April, 1916.)

PART XXVII.

141. *E. maculosa* R. T. Baker.
142. *E. præcox* Maiden.
143. *E. ovata* Labill.
144. *E. neglecta* Maiden.
Plates, 112-115. (Issued July, 1916.)

PART XXVIII.

145. *E. vernicosa* Hook f.
146. *E. Muelleri* T. B. Moore.
147. *E. Kitsoniana* (J. G. Luehmann) Maiden.
148. *E. viminalis* Labillardière.
Plates, 116-119. (Issued December, 1916.)

PART XXIX.

149. *E. Baeuerleni* F.v.M.
150. *E. scoparia* Maiden.
151. *E. Benthami* Maiden and Cambage.
152. *E. propinqua* Deane and Maiden.
153. *E. punctata* DC.
154. *E. Kirtoniana* F.v.M.
Plates, 120-123. (Issued February, 1917.)

PART XXX.

155. *E. resinifera* Sm.
156. *E. pellita* F.v.M.
157. *E. brachyandra* F.v.M.
Plates, 124-127. (Issued April, 1917.)

PART XXXI.

158. *E. tereticornis* Smith.
159. *E. Bancrofti* Maiden.
160. *E. amplifolia* Naudin.
Plates, 128-131. (Issued July, 1917.)

PART XXXII.

161. *E. Seeana* Maiden.
162. *E. exserta* F.v.M.
163. *E. Parramattensis* C. Hall.
164. *E. Blakelyi* Maiden.
165. *E. dealbata* A. Cunn.
166. *E. Morrisii* R. T. Baker.
167. *E. Howittiana* F.v.M.
Plates, 132-135. (Issued September, 1917.)

PART XXXIII.

168. *E. rostrata* Schlechtendal.
169. *E. rudis* Endlicher.
170. *E. Dundasi* Maiden.
171. *E. pachyloma* Benth.
Plates, 136-139. (Issued December, 1917.)

PART XXXIV.

172. *E. redunca* Schauer.
173. *E. accedens* W. V. Fitzgerald.
174. *E. cornuta* Labill.
175. *E. Websteriana* Maiden.
Plates, 140-143. (Issued April, 1918.)

PART XXXV.

176. *E. Lehmanni* Preiss
177. *E. annulata* Benth.
178. *E. platypus* Hooker.
179. *E. spathulata* Hooker.
180. *E. gamophylla* F.v.M.
181. *E. argillacea* W. V. Fitzgerald.
Plates, 144-147. (Issued August, 1918.)

PART XXXVI.

182. *E. occidentalis* Endlicher.
183. *E. macrandra* F.v.M.
184. *E. salubris* F.v.M.
185. *E. cladocalyx* F.v.M.
186. *E. Cooperiana* F.v.M.
187. *E. intertexta* R. T. Baker.
188. *E. confluens* (W. V. Fitzgerald) Maid
Plates, 148-151. (Issued January,

PART XXXVII.

189. *E. clavigera* A. Cunn.
190. *E. aspera* F.v.M.
191. *E. grandifolia* R.Br.
192. *E. papuana* F.v.M.
Plates, 152-155. (Issued March, 1

PART XXXVIII.

193. *E. tessellaris* F.v.M.
194. *E. Spenceriana* Maiden.
195. *E. Cliftoniana* W. V. Fitzgerald.
196. *E. setosa* Schauer.
197. *E. ferruginea* Schauer.
198. *E. Moorei* Maiden and Cambage.
199. *E. dumosa* A. Cunn.
200. *E. torquata* Luehmann.
9. *E. amygdalina* Labill.
201. *E. radiata* Sieber.
202. *E. numerosa* Maiden.
203. *E. nitida* Hook. f.
Plates 156-159. (Issued July, 191

PART XXXIX.

204. *E. Torelliana* F.v.M.
205. *E. corymbosa* Smith.
206. *E. intermedia* R. T. Baker.
207. *E. patellaris* F.v.M.
208. *E. celastroides* Turczaninow.
209. *E. gracilis* F.v.M.
210. *E. transcontinentalis* Maiden.
211. *E. longicornis* F.v.M.
73. *E. oleosa* F.v.M.
212. *E. Flocktoniæ* Maiden.
28. *E. virgata* Sieber.
213. *E. oreades* R. T. Baker.
214. *E. obtusiflora* DC.
215. *E. fraxinoides* Deane and Maiden.
Plates, 160-163. (Issued Febr 1920.)

PART XL.

216. *E. terminalis* F.v.M.
217. *E. dichromophloia* F.v.M.
218. *E. pyrophora* Benth.
219. *E. lævopinea* R. T. Baker.
220. *E. ligustrina* DC.
221. *E. stricta* Sieber.
222. *E. grandis* (Hill) Maiden.
Plates, 164-167. (Issued March, 1

INDEX OF PARTS PUBLISHED—*continued.*

PART XLI.

3. *E. latifolia* F.v.M.
4. *E. Foelscheana* F.v.M.
5. *E. Abergiana* F.v.M.
6. *E. pachyphylla* F.v.M.
4. *E. pyriformis* Turczaninow, var. *Kingsmilli* Maiden.
2. *E. Oldfieldii* F.v.M.
7. *E. Drummondii* Bentham.

Plates, 168-171. (Issued June, 1920.)

PART XLII.

8. *E. eximia* Schauer.
9. *E. peltata* Bentham.
0. *E. Watsoniana* F.v.M.
1. *E. trachyphloia* F.v.M.
2. *E. hybrida* Maiden.
3. *E. Kruseana* F.v.M.
4. *E. Dawsoni* R. T. Baker.
2. *E. polyanthemos* Schauer.
4. *E. Baueriana* Schauer.
5. *E. conica* Deane and Maiden.
0. *E. concolor* Schauer.

Plates, 172-175. (Issued August, 1920.)

PART XLIII.

6. *E. ficifolia* F.v.M.
7. *E. calophylla* R.Br.
8. *E. hæmatoxylon Maiden.*
9. *E. maculata Hook.*
0. *E. Mooreana* (W. V. Fitzgerald) Maiden.
1. *E. approximans* Maiden.
2. *E. Stowardi* Maiden.

Plates 176-179. (Issued November, 1920.)

PART XLIV.

3. *E. perfoliata R. Brown.*
4. *E. ptychocarpa* F.v.M.
5. *E. similis* Maiden.
16. *E. lirata* (W. V. Fitzgerald) Maiden, n.sp.
7. *E. Baileyana* F.v.M.
8. *E. Lane-Poolei* Maiden.
9. *E. Ewartiana* Maiden.
0. *E. Bakeri* Maiden.
1. *E. Jacksoni* Maiden.
2. *E. eremophila* Maiden.

Plates, 180-183. (Issued February, 1921.)

PART XLV.

53. *E. erythrocorys* F.v.M.
54. *E. tetrodonta* F.v.M.
55. *E. odontocarpa* F.v.M.
17. *E. capitellata* Smith.
56. *E. Camfieldi* Maiden.
57. *E. Blaxlandi* Maiden and Cambage.
58. *E. Normantonensis* Maiden and Cambage.

Plates, 184-187. (Issued April, 1921.)

PART XLVI.

259. *E. tetragona* F.v.M.
260. *E. eudesmioides* F.v.M.
261. *E. Ebbanoensis* Maiden n.sp.
15. *E. Andrewsi* Maiden.
262. *E. angophoroides* R. T. Baker.
263. *E. Kybeanensis* Maiden & Cambage.
264. (dup. of 252) *E. eremophila* Maiden.
70. *E. decipiens* Endl.

Plates, 188-191. (Issued May, 1921.)

PART XLVII.

265. *E. Laseroni* R. T. Baker.
266. *E. de Beuzevillei* Maiden.
267. *E. Mitchelli* Cambage.
268. *E. Brownii* Maiden and Cambage.
269. *E. Cambageana* Maiden.
123. *E. miniata* A. Cunn.
E. Woollsiana R. T. Baker.
44. *E. odorata* Behr and Schlecht.
43. *E. hemiphloia* F.v.M., var. *microcarpa* Maiden.
42. *E. bicolor* A. Cunn.
270. *E. Pilligaensis* Maiden.
271. *E. Penrithensis* Maiden.
112. *E. micranthera* F.v.M.
272. *E. notabilis* Maiden.
273. *E. canaliculata* Maiden.

Plates, 192-195. (Issued July, 1921.)

PART XLVIII.

61. *E. paniculata* Sm.
274. *E. decorticans* sp. nov.
275. *E. Culleni* R. H. Cambage.
276. *E. Beyeri* R. T. Baker.
98. *E. globulus* Labill.
277. *E. nova-anglica* Deane and Maiden.

THE GROWING TREE.

Rate of growth.
Natural afforestation.
Increment curves.
The largest Australian trees.

Plates 196-199. (Issued August, 1921.)

PART XLIX.

278. *E. drepanophylla* F.v.M.
33. *E. leptophleba* F.v.M.
279. *E. Dalrympleana* Maiden.
280. *E. Hillii* Maiden.
217. *E. dichromophloia* F.v.M.

THE GROWING TREE—*continued.*

Nanism.
The flowering of Eucalypts while in the juvenile-leaf stage.
Dominance or aggressiveness of certain species.
Natural grafts. Artificial grafts.
Fasciation. Tumours and galls.
Protuberances of the stem.
Abortive branches (prickly stems).
Pendulous branches.
Vertical growth of trees.

Plates, 200-203. (Issued September, 1921.)

PART L.

281. *E. Houseana* (W. V. Fitzgerald) Maiden.
282. *E. Jutsoni* Maiden.
283. *E. adjuncta* Maiden.
1. *E. pilularis* Sm., var. *pyriformis* Maiden.
284. *E. pumila* Cambage.
285. *E. rariflora* F. M. Bailey.
286. *E. Mundijongensis* Maiden.

THE BARK.

1. Early references to Eucalyptus barks and early Eucalyptus vernaculars in general.
2. Eucalyptus bark classifications.
O. Mallees, Marlocks, and other small species—
   (*a*) True Mallees.
   (*b*) False Mallees.
   (*c*) Marlocks.

Plates, 204-207 (Issued December, 1921.)

PART LI.

287. *E. Sheathiana* Maiden.
288. *E. striaticalyx* W. V. Fitzgerald.
289. *E. taeniola* Baker and Smith.
52. *E. Stricklandi* Maiden.
290. *E. unialata* Baker and Smith.
31. *E. Planchoniana* F.v.M.
21. *E. marginata* Sm.
291. *E. Irbyi* Baker and Smith.
292. *E. Yarraensis* Maiden and Cambage, n.sp.

THE BARK—*continued.*

1. *Leiophloiæ* (Smooth-Barks or Gums).
2. *Hemiphloiæ* (Half-barks).
3. *Rhytiphloiæ* (Rough-barks).
4. *Pachyphloiæ* (Stringybarks).
5. *Schizophloiæ* (Ironbarks).
6. *Lepidophloiæ* (Barks friable and lamellar).

Plates, 208-211. (Issued February, 1922.)

PART LII.

160. *E. amplifolia* Naudin.
292. x *E. algeriensis* Trabut.
293. x *E. antipolitensis* Trabut.
294. x *E. Bourlieri* Trabut.
295. x *E. Cordieri* Trabut.
296. x *E. gomphocornuta* Trabut.
297. x *E. jugalis* Naudin.
E. occidentalis Endl., var. *oranensis* Trabut.
298. x *E. pseudo-globulus* (Hort.) Naudin.
299. x *E. Trabuti* Vilmorin.
E. Stuartiana x *globulus* Trabut.
300. x *E. Insizwaensis* Maiden n.sp.

THE BARK—*continued.*

3. Classification of Trees in General by Means of their Barks.
4. Variation in Barks of the same Species.
5. Bark in Relation to Heat and Cold.
6. Adventitious Shoots.
7. Ringbarking.
8. Coppice-growth (suckering).
9. Twist in Bark.
10. Bark Repair.
11. Microscopic Characters of Bark.
12. Calcium Oxalate.
13. Tannin.
14. Oil in Bark.
15. Fibre in Bark.
16. Colour of Inner Bark.
17. Colour of Outer Bark.

Plates, 212-215. (Issued April, 1922.)